

pectinases.ST251  
SEQUENCE LISTING

&lt;110&gt; DSM IP Assets B.V.

&lt;120&gt; Novel Pectinases

&lt;130&gt; 20763WO

&lt;160&gt; 96

&lt;170&gt; PatentIn version 3.1

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&lt;211&gt; 1305

&lt;212&gt; DNA

&lt;213&gt; Aspergillus niger

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&lt;213&gt; Aspergillus niger

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&lt;210&gt; 11

&lt;211&gt; 1344

&lt;212&gt; DNA

&lt;213&gt; Aspergillus niger

&lt;400&gt; 11

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pectinases.ST251

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&lt;210&gt; 12

&lt;211&gt; 1602

&lt;212&gt; DNA

&lt;213&gt; Aspergillus niger

&lt;400&gt; 12

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## pectinases.ST251

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## pectinases.ST251

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<213> *Aspergillus niger*

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pectinases.ST251

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 <213> *Aspergillus niger*

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caatccagcg	gcggaggcgg	ctggggcgat	gggttcatca	acacgacact	ccacaaggga	180
gccaaaggta	taaactacgg	tcacgacgga	gccaccactg	tcagcttccg	ctccggaggc	240
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## pectinases.ST251

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<210> 15  
 <211> 1233  
 <212> DNA  
 <213> Aspergillus niger

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## pectinases.ST251

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<213> Aspergillus niger

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<213> Aspergillus niger

## pectinases.ST251

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<210> 18  
<211> 1611  
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<213> *Aspergillus niger*

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## pectinases.ST251

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&lt;211&gt; 1137

&lt;212&gt; DNA

&lt;213&gt; Aspergillus niger

&lt;400&gt; 19

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## pectinases.ST251

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&lt;210&gt; 20

&lt;211&gt; 1677

&lt;212&gt; DNA

&lt;213&gt; Aspergillus niger

&lt;400&gt; 20

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## pectinases.ST251

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&lt;210&gt; 21

&lt;211&gt; 1053

&lt;212&gt; DNA

<213> *Aspergillus niger*

## pectinases.ST251

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<210> 22  
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<213> Aspergillus niger

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gccactcccg ctgcgccccag cgacatcagc cagctgaaga cctggttgtc tgacagcacc 180  
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## pectinases.ST251

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 <212> DNA  
 <213> *Aspergillus niger*

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## pectinases.ST251

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&lt;210&gt; 24

&lt;211&gt; 1101

&lt;212&gt; DNA

&lt;213&gt; Aspergillus niger

&lt;400&gt; 24

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## pectinases.ST251

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 <213> *Aspergillus niger*

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pectinases.ST251

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<213> *Aspergillus niger*

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## pectinases.ST251

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&lt;210&gt; 27

&lt;211&gt; 756

&lt;212&gt; DNA

&lt;213&gt; Aspergillus niger

&lt;400&gt; 27

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## pectinases.ST251

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<210> 28  
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<212> DNA  
<213> *Aspergillus niger*

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## pectinases.ST251

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## pectinases.ST251

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pectinases.ST251

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## pectinases.ST251

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 <212> DNA  
 <213> Aspergillus niger

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## pectinases.ST251

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## pectinases.ST251

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<212> DNA  
<213> *Aspergillus niger*

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pectinases.ST251

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## pectinases.ST251

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## pectinases. ST251

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## pectinases.ST251

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## pectinases.ST251

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<211> 2576  
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<213> *Aspergillus niger*

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pectinases.ST251

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## pectinases.ST251

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## pectinases.ST251

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## pectinases.ST251

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## pectinases.ST251

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&lt;210&gt; 46

&lt;211&gt; 1178

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&lt;213&gt; Aspergillus niger

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<213> *Aspergillus niger*

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## pectinases.ST251

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## pectinases.ST251

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## pectinases.ST251

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<210> 49

<211> 3670

<212> DNA

<213> *Aspergillus niger*

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acccgcattga	cttggtccaa	caacttcctt	aacggcgtaa	ccaccactc	cgcaggctgc	2160
gatgatcacc	actattggac	aatggagcta	gttggccctg	gggaccaaata	tacttccag	2220
agtacgtgtc	ccatgaaaac	ctaaacgaag	catctattcg	actaacatac	gtgttcactc	2280
acagacaact	acgtctacca	caccacggc	cgtggaccccg	ctctctccgg	cacgaccctc	2340
ttccacgcag	tcaacagcgt	ctggcctcc	atccctggac	acgccatcga	ggcggtgac	2400
aaggcccgcg	gtcttttcga	gggatgcttc	ttcgaagatg	ttgtcgagat	tgcccccgcc	2460
aagcccgaga	accaactctt	cagcgccagc	gaagccaaacg	ccgcatcttgc	caagtccgccc	2520
ttggcccgcg	cttggccaggc	caatagctat	agcaaatacg	gtgtttttgg	cagctctgaa	2580
actggctttt	tcaaggactt	tgccggactg	actattgcac	cggccggctc	tgcgacggat	2640
gctctcgctt	atgttcctaa	gaattgtggt	attggcgctc	tttgaagctg	tgtatgcttaa	2700
aattggacgt	gttccagttat	gtatcaagca	ggagggtgga	ttgttaagttt	cttaagtttgc	2760
attaatgtat	ctaataatatc	tggattctgc	gogcaaccaa	tattctcctc	gtttctgcag	2820
tatcccttcat	taaacataact	tcacgtacact	caacagacta	tgattcg	tttaacatagca	2880

## pectinases.ST251

tacgacactt catatctagc tctaaggctc ggaatttcct tcacgtgaag cagccaaact 2940  
ggtagatcc aacttgagaa ttatctccct ctctgctcca actacccaca tcagtagcca 3000  
ataatcacga ccacaaacaa tatgaacctt tcttcgatg aaaatacacg ccacggaaag 3060  
agaaaaaaac caaagcaaca gccttaagta tgtagcgat tgctaggcac cgtacgttg 3120  
acaaaagtga aagtaa 3136

<210> 65  
<211> 434  
<212> PRT  
<213> Aspergillus niger

<400> 65

Met Lys Leu Pro Ile Leu Val Thr Leu Phe Ile Thr Leu Pro Ala Leu  
1 5 10 15

Cys Val Ser Ser Lys Thr Pro Ser Ala Pro Thr Ile Ser Ala Tyr Pro  
20 25 30

Lys Ser Pro Gly Asn Phe Lys Pro Ala Ser Gly Arg Gln Asn Ser Thr  
35 40 45

Ser Asn Val Cys Glu Val Lys Pro Asn Gln Thr Asp Ala Ala Pro Gly  
50 55 60

Ile Leu Ala Ala Ala His Thr Cys Asn Asn Gly Gly Thr Val Phe Leu  
65 70 75 80

Pro Pro Gly Asp Phe Val Val Ala Thr Ala Leu Asp Leu Thr Phe Leu  
85 90 95

Asn Asn Ile Asp Phe Ala Ile Trp Gly Asn Ile Thr Phe Lys Lys Asp  
100 105 110

Ile Asp Leu Trp Thr Thr Gln Ala Phe Gln Tyr Thr Phe Gln Thr Ala  
115 120 125

Ser Leu Phe Trp Arg Phe Gly Gly Asn Asn Val Asn Ile Tyr Gly Asp

130 135 pectinases.ST251 140

Gly Lys Gly Val Ile Asp Gly Ala Gly Gln Tyr Trp Trp Ser Ala Met  
145 150 155 160

Ala Glu Asp Ser Ser Val Met Arg Pro Cys Leu Leu Gly Thr Asp Gly  
165 170 175

Leu His His Ala Thr Ile Ser Gly Leu Thr Met Leu Asn Ser Pro Asn  
180 185 190

Trp Phe Asn Leu Ile Ala Asn Ser Thr Asp Ile Leu Ile Ser Asn Met  
195 200 205

Thr Met Leu Val Glu Ser Glu Ile Ser Asp Ala Pro Ala Lys Asn Thr  
210 215 220

Asp Gly Trp Asp Ile Tyr Arg Ser Ser Asn Ile Val Ile Gln Asp Ser  
225 230 235 240

Arg Ile Val Asn Thr Asp Asp Cys Val Ser Phe Lys Pro Asn Ser Thr  
245 250 255

Gln Ile Val Ile Gln Asn Leu Asp Cys Thr Gly Ser His Gly Ile Ser  
260 265 270

Val Gly Ser Leu Gly Gln Tyr Gln Gly Glu Thr Asp Ile Val Glu Asp  
275 280 285

Leu Tyr Ile Tyr Asn Ile Ser Met Thr Asp Ala Ser Asp Val Ala Arg  
290 295 300

Ile Lys Val Trp Pro Gly Val Pro Ala Asp Thr Ser Gly Ser Thr Ser  
305 310 315 320

Gly Gly Gly Leu Gly Arg Val Arg Asn Val Thr Tyr Glu His Met Gln  
325 330 335

Ser Glu Asn Asn Asp His Ile Ile Ser Val Ser Gln Cys Tyr Glu Ser

## pectinases.ST251

340

345

350

Lys Asn Gln Thr Met Cys Asp Ser Tyr Pro Ser Lys Leu Val Ile Glu  
355 360 365

Asp Val Leu Phe Lys Asp Phe Lys Gly Thr Thr Ser Lys Lys Tyr Asp  
370 375 380

Pro Glu Ile Gly Glu Leu Thr Cys Ser Ser Pro Asp Val Cys His Asn  
385 390 395 400

Ile Thr Val Gln Asp Ile Asn Val Thr Pro Pro Ser Gly Asp Ser Pro  
405 410 415

Thr Phe Thr Cys Asn Asn Met Gly Asn Ser Asn Leu Glu Asp Ile Thr  
420 425 430

Cys Ala

<210> 66

<211> 463

<212> PRT

<213> Aspergillus niger

<400> 66

Met Ser Trp Ser Ser Pro Ala Ala Gln Tyr Ile Tyr Val Leu Val Ile  
1 5 10 15

Gln Leu His Leu Trp Phe Ile Leu Lys Thr Ala Phe Ser Pro Ser Asn  
20 25 30

Gln Ala Met Ala Pro Ile Ala Leu Lys Ile Leu Leu Phe Thr Ser Leu  
35 40 45

Ile Val Pro Ser Ile Ser Leu Ser Asp Gln Ala Arg Asn Gly His Ala  
50 55 60

Arg Thr Ile Cys Glu Val Lys Pro Gly Gly Ser Ser Glu Ile Asp Asp  
65 70 75 80

## pectinases.ST251

Val Pro Ala Ile Val Asp Ala Leu Thr Thr Cys Gly Ser Gly Gly Arg  
85 90 95

Val Ile Phe Ser Asn Asn Thr Tyr His Ile Asn Ser Val Met Asn Thr  
100 105 110

Thr Trp Leu Asp Asp Val Glu Ile Asp Leu Gln Gly Thr Leu Leu Trp  
115 120 125

Ser Thr Asn Ile Ser Tyr Trp Leu Asn His Ser Leu Pro Val Gly Tyr  
130 135 140

Gln Asn Gln Ser Thr Ala Trp Ile Leu Gly Gly Lys Asp Ile Val Phe  
145 150 155 160

Glu Gly His Gly Tyr Gly Thr Phe Asn Gly Ser Gly Gln Thr Trp Tyr  
165 170 175

Arg Tyr Val Gly Ser Thr Ser Asn Tyr Pro Arg Arg Pro Asn Gln Leu  
180 185 190

Thr Val Ser Gly Ala Met Gly Ala Val Phe Lys Gly Leu Arg Phe Val  
195 200 205

Gln Ser Gln Met Trp Thr Met Ser Ile Ile His Thr Ser Asn Ser Trp  
210 215 220

Phe Asp Ser Ile Tyr Val Asn Asn Leu Tyr Asp Asp Gly Gly Ser Ala  
225 230 235 240

Gln Asn Thr Asp Gly Ala Asn Thr Ile Tyr Ser Lys Asn Ile Thr Leu  
245 250 255

Thr Asn Trp Glu Val Val Asn Gly Asp Asp Ser Ile Ser Thr Lys Ala  
260 265 270

Asn Ser Thr Asp Ile Thr Ile Ala Asn Cys Thr Phe Thr Ser Gly Leu  
275 280 285

## pectinases.ST251

Gly Ile Ala Ile Gly Ser Ile Gly Gln Tyr Asn Gly Ala Phe Glu Thr  
290 295 300

Val Glu Arg Leu Lys Ile Ser Asn Ile Thr Tyr Glu Lys Thr Thr His  
305 310 315 320

Ala Val Tyr Phe Lys Thr Trp Thr Gly Asp Gln Val Gly Tyr Pro Pro  
325 330 335

Asn Gly Gly Gly Leu Gly Tyr Ala Ser Asp Ile Val Ala Thr  
340 345 350

Asn Leu Lys Thr Asn Asn Leu Lys Gly Ala Pro Phe Thr Ile Ser Gln  
355 360 365

Cys Thr Thr Phe Ser Gly Ala Ser Gly Asn Cys Thr Asn Ser Lys Phe  
370 375 380

Gln Ile Arg Asp Leu Val Phe Thr Asp Ile Ser Gly Thr Thr Asp Ser  
385 390 395 400

Ser Asp Val Ala Ser Phe Gln Cys Ser Ala Val Ala Pro Cys Glu Asp  
405 410 415

Ile Thr Ile Glu Asn Val Ser Leu Arg Ile Ala Gly Asn Thr Thr His  
420 425 430

Ala Glu Glu Tyr Leu Cys Gly Asn Val Asp Gly Thr Val Gly Phe Asn  
435 440 445

Cys Thr Gly Asp Val Cys Val Gly Ser Ser Ala Thr Gly Gly Cys  
450 455 460

<210> 67

<211> 423

<212> PRT

<213> Aspergillus niger

<400> 67

## pectinases.ST251

Met Gln Leu Arg Ala Ser Val Leu Leu Ser Phe Leu Gly Leu Ala Ser  
1 5 10 15

Val Gly His Ala Gly Asn Val Glu Asn Asn His Asn Val Cys Thr Val  
20 25 30

Arg Ala Asn Gly Gly His Gln Asp Asp Val Pro Asn Ile Met Ala Ala  
35 40 45

Phe Lys Glu Cys Gly Asn Gly Gly Thr Ile Ile Phe Pro Glu Asp Gln  
50 55 60

Ser Tyr Trp Ile Ala Thr Arg Leu His Pro Thr Leu Lys Asp Val Ala  
65 70 75 80

Ile Glu Trp Arg Gly Lys Trp Thr Phe Ser Asp Asn Leu Thr Tyr Trp  
85 90 95

Arg Asn Asn Ser Tyr Pro Ile Ala Phe Gln Asn His His Ala Gly Phe  
100 105 110

Ile Ile Ser Gly Asp Asn Ile Thr Ile Asn Gly Tyr Gly Thr Gly Gly  
115 120 125

Ile Asp Gly Asn Gly Asn Thr Trp Tyr Thr Ala Glu Lys Gly Asp Thr  
130 135 140

Gln Pro Gly Arg Pro Met Pro Phe Val Phe Trp Asn Val Ser Glu Val  
145 150 155 160

Ile Val Asp Ser Phe Tyr Val Lys Asp Pro Pro Leu Trp Ser Val Asn  
165 170 175

Ile Met Asn Gly Thr Asn Met Arg Phe Asn Asn Ile Tyr Cys Asn Ala  
180 185 190

Thr Ala Val Asp Ala Pro Trp Gly Asp Asn Trp Val Gln Asn Thr Asp  
195 200 205

## pectinases.ST251

Gly Phe Asp Thr Met Asp Ala Thr Asn Ile Gln Leu Thr Asn Phe Val  
210 215 220

Tyr Gln Gly Gly Asp Asp Cys Ile Ala Ile Lys Pro Arg Ser Tyr Asn  
225 230 235 240

Ile Asp Ile Gln Asn Val Thr Cys Arg Gly Gly Asn Gly Ile Ala Ile  
245 250 255

Gly Ser Leu Gly Gln Tyr Leu Glu Asp Ser Ser Val Ala Asn Ile Arg  
260 265 270

Val Asp Lys Val Asn Ile Ile Arg Tyr Asn Glu Asp Met His Asn Ser  
275 280 285

Ala Tyr Leu Lys Thr Trp Val Gly Ala Leu Val Pro Gln Ser Ser Tyr  
290 295 300

Glu Ser Ala Gly Val Pro Arg Gly Asp Gly Trp Gly Ser Ile Arg Asn  
305 310 315 320

Val Leu Phe Ser Asn Phe Asn Val Gln Gly Ala Ser Ala Gly Pro Ser  
325 330 335

Ile Ser Gln Asp Ser Gly Asp Asn Gly Ser Tyr Ala Gly Thr Ser Lys  
340 345 350

Met Ser Ile Ser Asn Val Ala Phe Val Asn Phe Thr Gly Trp Val Asp  
355 360 365

Thr Glu Lys Ser Val Val Ser Thr Val Ser Cys Ser Glu Val His Pro  
370 375 380

Cys Tyr Asn Ile Asp Tyr Asp Asn Val Val Leu Tyr Pro Gly Lys Asn  
385 390 395 400

Ala Thr Thr Ala Gly Thr Gly Ser Cys Lys Tyr Thr Ala Asp Gly Gly  
405 410 415

## pectinases.ST251

Val His Gly Leu Ser Gly Cys  
420

<210> 68  
<211> 343  
<212> PRT  
<213> Aspergillus niger

<400> 68

Met Pro Ser Ala Ile Ser Ile Gly Val Ile Ala Gly Leu Ser Val Ala  
1 5 10 15

Ala Ser Ala Val Pro Ser Leu Gln Lys Asn Gly Thr Thr Cys Thr Val  
20 25 30

Ile Pro Leu Gly Asn Gly Gln Asp Asp Val Pro Asn Ile Leu Ser Ala  
35 40 45

Val Asp Glu Cys Gly Gln Thr Ser Gly Gly Arg Val Val Leu Pro Ala  
50 55 60

Pro Tyr Thr Tyr Arg Ile Asn Gln Arg Met Thr Thr His Leu Thr Asp  
65 70 75 80

Ser Arg Leu Glu Ile Gly Gly Thr Leu Leu Phe Ser Asp Asp Ile Asp  
85 90 95

Tyr Trp Val Asn Asn Ser Tyr Arg Val Asp Phe Gln Asn Gln Ser Ser  
100 105 110

Ala Trp Arg Ile Thr Gly His Asp Tyr Val Val Asp Gly Gly Pro Arg  
115 120 125

Gln Gly Gly Val Asp Gly Asn Gly Gln Leu Trp Tyr Thr Trp Ala Lys  
130 135 140

Gly Gly Ser Asn Val Phe Gly Arg Pro Met Pro Val His Val Phe Glu  
145 150 155 160

## pectinases.ST251

Ser Thr Arg Ala Thr Leu Arg Asn Leu Ala Ile Arg Gln Pro Gln Phe  
165 170 175

Trp Ala Val Leu Val Asp Ser Ser His Ile Asn Leu Asp Asn Phe  
180 185 190

Tyr Val Asn Ala Thr Asn His Asp Ser Ser Val Ser Pro Glu Gly Glu  
195 200 205

Trp Val Gln Asn Thr Asp Gly Ile Asp Thr Tyr Arg Ser Asp His Ile  
210 215 220

Thr Val Thr Asn Trp Val Tyr Gln Gly Gly Asp Asp Ala Val Ala Phe  
225 230 235 240

Lys Gly Asn Ser Thr Asn Ile His Val Glu Asn Val Thr Val Tyr Gly  
245 250 255

Gly Pro Gly Ile Ala Phe Gly Ser Leu Gly Gln Tyr Pro Asp Arg Thr  
260 265 270

Asp Ile Val Glu Asn Val Thr Val Arg Asn Val Arg Val Gln Pro Ser  
275 280 285

Phe Gln Arg Ala Met Asn Ser Gly Val Tyr Phe Lys Ser Trp Ile Gly  
290 295 300

Val Asn Tyr Gly Val Pro Pro Asn Gly Gly Gly Gly His Gly Tyr  
305 310 315 320

Val Arg Asn Val Ser Val Glu Asn Leu Arg Leu Lys Asp Val Gln Leu  
325 330 335

Pro Val Tyr Ile Asp Thr Trp  
340

<210> 69  
<211> 438  
<212> PRT  
<213> Aspergillus niger

## pectinases.ST251

&lt;400&gt; 69

Met Tyr Leu Leu Pro Leu Thr Leu Phe Leu Thr Ala Ala Phe Gly Val  
1 5 10 15

Ser Ile Pro Arg Ser Pro Leu Ile Pro Gly Ala Gln Ile Val Pro Ala  
20 25 30

Ser Ser Thr Ala Asp Leu Arg Ala Ile Gly Ala Gln His His Lys Tyr  
35 40 45

Pro Asp Arg Glu Thr Val Thr Ile Arg Ala Ser Arg Asn Ala Leu Asp  
50 55 60

Asp Val Ser Ser Asp Phe Leu Trp Gly Leu Lys Gln Ala Asn His Gly  
65 70 75 80

Gly Arg Leu Leu Leu Lys Gln Gly Glu Thr Tyr Val Ile Gly Lys Lys  
85 90 95

Leu Asp Leu Thr Phe Leu Asp Asn Ile Glu Val Gln Leu Glu Gly Glu  
100 105 110

Ile Gln Phe Thr Asn Asn Ile Thr Tyr Trp Gln Ala Asn Asn Phe Tyr  
115 120 125

Tyr Asp Phe Gln Lys Ser Ile Thr Phe Trp Arg Trp Gly Gly Gln Asp  
130 135 140

Ile Lys Ile Phe Gly Ser Gly Val Leu Asn Gly Asn Gln Lys Trp  
145 150 155 160

Tyr Asp Glu Phe Ala Gly Lys Gln Ile Leu Val Tyr Asn Thr Phe Tyr  
165 170 175

Arg Pro Ile Leu Phe Leu Thr Asp Asn Ala Thr Arg Ile Ser Val Glu  
180 185 190

Gly Ile Thr Gln Leu Asn Ser Pro Cys Trp Thr Asn Phe Phe Val Arg

195 pectinases. ST251  
200 205

Thr Asn Asp Val Ser Phe Asp Asn Val Tyr Ile His Ala Phe Ser Thr  
210 215 220

Asn Ala Ser Ser Asp Pro Ala Asn Thr Asp Gly Met Asp Ser Leu Asp  
225 230 235 240

Val Asp Gly Val Ser Phe Thr Asn Met Arg Ile Asp Val Gly Asp Asp  
245 250 255

Cys Phe Ser Pro Lys Pro Asn Thr Thr Asn Ile Phe Val Gln Asn Met  
260 265 270

Trp Cys Asn Asn Thr His Gly Val Ser Met Gly Ser Ile Gly Gln Tyr  
275 280 285

Ala Gly Glu Met Asp Ile Ile Glu Asn Val Tyr Ile Glu Asn Val Thr  
290 295 300

Leu Leu Asn Gly Gln Asn Gly Ala Arg Leu Lys Ala Trp Ala Gly Gln  
305 310 315 320

Asp Val Gly Tyr Gly Arg Ile Asn Asn Val Thr Tyr Lys Asn Ile Gln  
325 330 335

Ile Gln Asn Thr Asp Ala Pro Ile Val Leu Asp Gln Cys Tyr Phe Asp  
340 345 350

Ile Asn Ala Thr Glu Cys Ala Lys Tyr Pro Ser Ala Val Asn Ile Thr  
355 360 365

Asn Ile Leu Phe Glu Asn Ile Trp Gly Ser Ser Ser Gly Lys Asp Gly  
 370 375 380

Lys Ile Val Ala Asp Leu Val Cys Ser Pro Asp Ala Val Cys Thr Asn  
385 390 395 400 405

Ile Thr Leu Ser Asp Val Asp Leu Thr Ser Ser Pro Ile Asp Glu Thr Ala Glu

## pectinases.ST251

405

410

415

Ile Val Cys Asp Asp Ile Gln Gly Gly Ile Gly Val Asp Cys Val Ser  
420 425 430

Asp Glu Ser Val Thr Arg  
435

<210> 70  
<211> 397  
<212> PRT  
<213> Aspergillus niger

<400> 70

Met Leu Leu His Gly Leu Leu Leu Ala Leu Gln Ala Ile Leu Ala Ser  
1 5 10 15

Ser Ala Ala Ile Thr Ser Pro Ser Ser Asn His Leu Ser Thr Ala Ala  
20 25 30

Arg Glu Lys Cys Gln Thr Thr Leu Gln Cys Pro Pro Gly Thr Leu Ile  
35 40 45

Val Ser Asn Thr His Pro Gln Leu Ser Asn Phe Thr Thr Leu Gln Ala  
50 55 60

Ala Ile Asn Ala Leu Pro Asn Asp Asn Ser Ser Gln Thr Ile Leu Leu  
65 70 75 80

Leu Ser Gly Ser Tyr Asn Glu Gln Val Asn Ile Thr Arg Ser Gly Pro  
85 90 95

Ile Thr Leu Leu Gly Gln Gln Pro Asp Arg Ala Ala Leu Thr Asp Pro  
100 105 110

Ala Arg Asn Thr Val Asn Leu Thr Phe Ala Gly Ala Asn Ser Asp Ser  
115 120 125

Thr Gly Asp Ile Asp Asn Val Trp Phe Ser Val Met Val Val Ala Pro  
130 135 140

## pectinases.ST251

Thr Leu Asp Ala Ser Leu Thr Gly Ser Gly Thr Thr Gly Tyr Pro Val  
145 150 155 160

Pro Ala Asp Thr Pro Phe Gly Asn Thr Asp Phe Arg Val Tyr Asn Ile  
165 170 175

Asp Phe Arg Asn Thr Tyr Ala Pro Tyr Ser Ala Gly Pro Ala His Ala  
180 185 190

Ile Ser Phe Ser Arg Ser Asn Gly Gly Phe Tyr Tyr Cys Gly Phe Tyr  
195 200 205

Ser Tyr Gln Asp Thr Ile Tyr Ile Gly Lys Leu Gly Ser Ala Tyr Met  
210 215 220

Tyr Lys Ser Ile Leu Ala Gly Gln Thr Asp Phe Leu Tyr Gly Phe Gly  
225 230 235 240

Thr Leu Phe Ile Gln Ser Ser Gln Ile Val Leu Arg Ser Cys Gly Gly  
245 250 255

Gly Ile Thr Ala Trp Lys Gly Thr Asn Thr Thr Val Arg Asn Asn Tyr  
260 265 270

Gly Val Tyr Ile His Asp Ser Thr Val Asn Ala Ala Asn Thr Ser Ile  
275 280 285

Ala Glu Gln Ile Lys Gly Ser Cys Ala Leu Gly Arg Pro Trp Asn Ser  
290 295 300

Leu His Arg Ser Ile Phe Ala Asn Thr Tyr Glu Asp Gly Ser Ile Glu  
305 310 315 320

Pro Ser Gly Tyr Ile Asn Trp Glu Asp Arg Trp Ser Lys Asn Glu Thr  
325 330 335

Leu Met Ala Glu Tyr Lys Ala Tyr Gly Pro Gly Phe Asn Leu Thr Gly  
340 345 350

## pectinases.ST251

Arg Arg Glu Ser Glu Val Ser Val Leu Leu Ser Ser Ser Glu Glu Glu  
355 360 365

Arg Tyr Arg Asp Pro Ser Arg Leu Phe Leu Phe Glu Asp Gly Arg Glu  
370 375 380

Gly Asn Val Ala Trp Ile Asp Trp Asp Val Val Ser Ser  
385 390 395

<210> 71  
<211> 327  
<212> PRT  
<213> Aspergillus niger

<400> 71

Met His Thr Pro Tyr Leu Leu Gly Ala Leu Ala Ala Leu Ala Ala Thr  
1 5 10 15

Ala Val Gly Ala Pro Ala Glu His Ile Lys Lys Arg Glu Ser Arg Thr  
20 25 30

Ser Ala Pro Ser Gly Cys Leu Thr Val Gly Ser Asp Gly Thr Tyr Ser  
35 40 45

Thr Ile Gly Asp Ala Leu Asp Ala Leu Gly Ser Ser Thr Ser Ser Ala  
50 55 60

Cys Ile Tyr Val Ala Ser Gly Thr Tyr Glu Glu Gln Leu Thr Ile Asp  
65 70 75 80

Tyr Ala Gly Asn Leu Thr Leu Tyr Gly Glu Thr Thr Asp Thr Ser Thr  
85 90 95

Tyr Lys Asp Asn Val Val Thr Ile Thr His Thr Ile Ser Ser Ser Asp  
100 105 110

Ala Gly Ser Leu Asp Lys Ser Ala Thr Val Asn Val Val Ser Asp Gly  
115 120 125

## pectinases.ST251

Phe Ser Met Tyr Asn Ile Asn Val Glu Asn Gly Tyr Gly Glu Gly Ala  
130 135 140

Gln Ala Val Ala Leu Val Gly Asn Ala Asp Gln Leu Gly Phe Tyr Gly  
145 150 155 160

Cys Gln Phe Ser Gly Tyr Gln Asp Thr Leu Tyr Val Lys Ala Gly Thr  
165 170 175

Gln Tyr Tyr Ser Asn Cys Met Ile Glu Gly Ala Val Asp Tyr Ile Phe  
180 185 190

Gly Asp Ala Ser Val Trp Phe Gly Glu Cys Asp Ile Val Ser Asn Gly  
195 200 205

Ala Gly Ala Ile Thr Ala Ser Ser Arg Glu Thr Ser Ser Asp Ser Gly  
210 215 220

Trp Tyr Ala Ile Asp Asn Cys Asn Ile Lys Ala Ala Ser Gly Val Ser  
225 230 235 240

Leu Thr Glu Glu Val Tyr Leu Gly Arg Pro Trp Arg Val Leu Ala Arg  
245 250 255

Val Ile Tyr Gln Asn Ser Val Leu Ser Asp Ile Ile Asn Pro Lys Gly  
260 265 270

Trp Thr Thr Met Ala Asp Gly Ala Thr Pro Leu Tyr Tyr Glu Tyr Asn  
275 280 285

Asn Ser Gly Ala Gly Ser Asp Thr Ser Asp Arg Glu Tyr Glu Thr Ser  
290 295 300

Ile Ser Ala Ala Val Asp Lys Thr Thr Val Leu Gly Glu Thr Trp Gly  
305 310 315 320

Asp Trp Ile Asp Arg Ser Tyr  
325

## pectinases.ST251

<210> 72  
<211> 459  
<212> PRT  
<213> Aspergillus niger

<400> 72

Met Arg Ala Ser Ile Leu Pro Leu Thr Leu Phe Leu Ala Thr Leu Ala  
1 5 10 15

Gly Ala Gln Leu Ser Gly Pro Val Gly Pro Leu Val Asp Tyr Ser Thr  
20 25 30

Lys Ala Arg Asn Gln Thr Cys Asn Ile Ile Asp Tyr Gly Ala Val Ala  
35 40 45

Asp Gly Lys Thr Asp Ile Ser Gln Ala Leu Leu Asp Ala Trp Gly Asn  
50 55 60

Cys Ser Val Gly Gly Leu Val Tyr Ile Pro Pro Gly Asn Tyr Ser Leu  
65 70 75 80

Ala Glu Asp Ile Glu Leu Lys His Gly Gln Ser Ser Ala Ile Gln Leu  
85 90 95

Asp Gly Val Val Met Arg Gly His Arg Gly Ser Tyr Gln Met Ile Leu  
100 105 110

Ile Arg Asp Cys Asn Asp Phe Glu Phe Ser Gly Asn Ser Arg Gly  
115 120 125

Ala Ile Gln Gly Phe Gly Tyr Glu Tyr Leu Gln Asn Asp Thr Tyr Gly  
130 135 140

Glu Arg Leu Leu Arg Ile Gln Glu Val Asn Asn Phe Ser Val His Gly  
145 150 155 160

Phe Ala Leu Ile Asp Ser Pro Ser Tyr Tyr Ile Val Phe Asp Thr Val  
165 170 175

## pectinases.ST251

Thr Ser Gly Glu Val Tyr Asn Ile Leu Ile Arg Gly Val Thr Ser Val  
180 185 190

Gly Ala Thr Asp Ala Ile Asp Val Trp Gly Glu Asn Met Trp Phe His  
195 200 205

Asp Ile Glu Val Ser Asn Gly Asp Glu Cys Val Thr Val Lys Ser Pro  
210 215 220

Ala His Asn Tyr Leu Ile Glu Asn Ile Tyr Cys Asn Leu Ser Gly Gly  
225 230 235 240

Thr Ala Ile Gly Ser Leu Gly Thr Gly Thr Asn Ile Ser Asp Ile His  
245 250 255

Tyr Arg Asn Leu Tyr Met Asn Gln Ala Asp Ala Cys Phe Leu Lys Ser  
260 265 270

Asn Asn Gly Asp Gly Ile Val Lys Asn Ile Ile Trp Glu Asn Val Ile  
275 280 285

Val His Gly Gly Pro Tyr Pro Leu Ala Ile Asp Glu Ala Trp Gly Asp  
290 295 300

Asp Arg Gly Ser Val Gly Val Gln Val Ser Asn Leu Thr Phe Arg Asn  
305 310 315 320

Trp His Gly Glu Ser Val Ser Ala Ser Arg Pro Val Ile Arg Leu Gln  
325 330 335

Cys Asp Ser Asp Val Pro Cys Tyr Asp Ile Thr Ile Glu Asn Val Asn  
340 345 350

Leu Trp Ala Asn Asp Ser Asn Tyr Val Val Trp Gln Cys Glu Asn Ala  
355 360 365

Tyr Gly Asp Gly Ala Cys Leu Ser Ser Ala Glu Gly Thr Lys Asp Leu  
370 375 380

## pectinases.ST251

Glu Thr Phe Thr Ser Lys Gln Thr Ile Thr Ala Thr Pro Ser Tyr Ala  
385 390 395 400

Ala Pro Thr Met Ala Ala Asp Phe Thr Phe Asn Leu Pro Ser Thr Ser  
405 410 415

Pro Phe Thr Ile Pro Pro Met Pro Thr Ser Phe Tyr Pro Gly Ala Thr  
420 425 430

Pro Ile Ser Thr Leu Leu His Leu His Gly Ala Gly Gly Leu Pro Ser  
435 440 445

Ala Ser Pro Ile Ser His His Arg Arg His Gln  
450 455

<210> 73  
<211> 474  
<212> PRT  
<213> Aspergillus niger

<400> 73

Met Arg Ser Ile Leu Phe Ile Leu Phe Ser Val Phe Ala Gly Leu Ala  
1 5 10 15

Ala Gly Gln Leu Ile Gly Pro Val Gly Pro Thr Thr Gln Leu Glu Asp  
20 25 30

Lys Asp Ile Glu Cys Asn Ile Leu Asp Tyr Gly Gly Val Ala Asp Asn  
35 40 45

Glu Thr Asp Val Ala Thr Ser Ile Glu Thr Thr Phe Thr Glu Cys Val  
50 55 60

Leu Asn Asn Pro Lys Ser Arg Leu Val Ile Pro Glu Gly Asp Tyr Leu  
65 70 75 80

Ile Lys Arg Ser Val Val Leu Ser Asn Gly Thr Asn Trp Ala Phe Gln  
85 90 95

Leu Asp Gly Leu Ile Thr Ala Ala Tyr Gly Gly Asn Trp Thr Val Asp

## pectinases.ST251

100

105

110

Pro Val Asp Phe Glu Phe Tyr Ser Ser Asn Gly Leu Gly Ala Phe Gln  
115 120 125

Gly Gln Gly Tyr Ile Tyr Arg Asn Leu Ala Asn Thr Asp Arg Pro Arg  
130 135 140

Leu Val Arg Leu Ile Ser Pro Thr Asn Ala Ser Val His Asp Leu Ile  
145 150 155 160

Leu Val Asp Ser Pro Lys Phe His Ile Val Phe Asp Phe Ala Val Asn  
165 170 175

Leu Glu Ala Tyr His Leu Thr Ile Arg Gly Ala Asn Leu Gly Ser Tyr  
180 185 190

Asp Gly Ile Asp Ala Ile Gly Thr Asn Tyr Tyr Ile His Asp Asn Glu  
195 200 205

Ala Ile Thr Asn Arg Asp Glu Cys Val Ser Val Lys Ser Pro Ser His  
210 215 220

His Ala Leu Val Glu Asn Leu Val Cys Asn Gln Ala Gly Ser Gly Val  
225 230 235 240

Ser Ile Gly Ser Leu Asn Val Ser Ala Glu Ile Ser Asn Ile Glu Ala  
245 250 255

Arg Asn Ile Ser Ile Ile Gln Gly Asn Asn Ile Ala Phe Ile Lys Thr  
260 265 270

Tyr Pro Gly Gly Ser Gly Tyr Val Lys Asp Val Thr Phe Glu Asn Phe  
275 280 285

Arg Ser Leu Asn Ser Leu Tyr Gly Leu Asp Ile Asn Gln Tyr Trp Gln  
290 295 300

Asn Thr Trp Glu Pro Asp Thr Gly Ser Val Thr Leu Ser Asn Leu Val

pectinases.ST251

305	310	315	320
Phe Lys Asn Phe Ser Gly Ser Val Ala Asp Gly Ala Leu Arg Pro Pro			
325		330	335
Leu Tyr Leu Phe Ala Ser Asp Leu Thr Phe Ala Thr Asn Val Thr Val			
340	345		350
Glu Glu Phe Ser Val Trp Thr Glu Thr Gly Thr Thr Val Val Asn Lys			
355	360		365
Ile Ser Asn Ile Phe Gly Thr Gly Asp Asp Ser Tyr Gly Glu Asn Asp			
370	375		380
Gly Ile Glu Ser Leu Gln Ser Gly Glu Ser Pro Tyr Thr Tyr Thr Ser			
385	390	395	400
Thr Tyr Thr Ile Thr Ala Ser Pro Thr Asn Trp Gln Ala Pro Ser Thr			
405		410	415
Pro Thr Trp Ala Leu Pro Ser Thr Gly Tyr Gly Ser Lys Phe Asn Glu			
420	425		430
Asn Cys Ser Gly Tyr Phe Tyr Ile Ala Asn Leu Ser Thr Ala Ala Ser			
435	440		445
Pro Ile Pro Val Tyr Thr Pro Ala Pro Leu Trp Arg Pro Gly Gly Ile			
450	455	460	
Asp Tyr Asn Leu His Tyr Trp Gly Ser Phe			
465	470		
<210> 74			
<211> 443			
<212> PRT			
<213> Aspergillus niger			
<400> 74			
Met Leu Val Thr Ser Leu Ile Ala Leu Leu Pro Ala Ile Ala Ala Ala			
1	5	10	15

## pectinases.ST251

Gln Val Ser Gly Thr Val Gly Pro Arg Thr Ser Ala Ser Ala Lys Ala  
20 25 30

Ala Glu Lys Val Cys Asn Val Leu Asp Tyr Gly Ala Ser Ala Asn Ser  
35 40 45

Thr Ile Asp Ile Gly Pro Pro Leu Lys Glu Ala Phe Gln Asp Cys Gln  
50 55 60

Thr Gly Gly Leu Val Tyr Ile Pro Glu Gly Asp Tyr Leu Leu Ser Ser  
65 70 75 80

Trp Val Ser Leu Val Tyr Gly Ser Gly Trp Ala Leu Gln Leu Asp Gly  
85 90 95

Ile Ile Tyr Arg Asp Lys Asn Val Thr Asp Gly Gly Asn Met Ile Phe  
100 105 110

Ile Glu His Thr Ser Asp Ile Glu Ile Phe Ser Asn Asn Ser Ala Gly  
115 120 125

Ala Ile Gln Gly Tyr Gly Tyr Leu Phe His Glu Gln Asp Glu Tyr Gly  
130 135 140

Pro Arg Ile Leu Arg Leu Asn Asn Val Thr Asp Phe Ser Val His Asp  
145 150 155 160

Leu Ile Leu Val Asp Ser Pro Ala Tyr Phe Leu Asn Leu Val Glu Ser  
165 170 175

Tyr Asn Gly Glu Val Tyr Asn Met Val Ile Arg Gly Ala Ser Met Gly  
180 185 190

Gly Leu Asp Gly Ile Asp Ile Ser Gly Ala Asn Tyr Trp Ile His Asp  
195 200 205

Val Glu Val Thr Asn Gly Asp Glu Cys Val Thr Val Lys Ser Pro Ser  
210 215 220

## pectinases.ST251

Ala Asn Val Arg Val Glu Asn Val Phe Cys Asn His Ser Gly Gly Cys  
225 230 235 240

Ala Met Gly Ser Leu Gly Thr Asp Thr Asn Ile Ser Asn Ile Glu Phe  
245 250 255

Glu Asn Ile Tyr Thr Tyr Asn Ser Thr Gln Met Tyr Met Ile Lys Ser  
260 265 270

Asn Gly Gly Asn Gly Thr Val Thr Asn Cys Ser Phe Lys Asn Phe Ile  
275 280 285

Gly Tyr Ser Asn Ala Tyr Met Leu Asp Leu Asp Thr Tyr Trp Gly Asp  
290 295 300

Glu Ser Asp Gly Asp Gly Ile Lys Tyr Glu Asn Ile Gly Phe Glu Asn  
305 310 315 320

Trp Lys Gly Thr Ser Ser Asn Gly Ile Gln Arg Ser Pro Ile Arg Ile  
325 330 335

Leu Cys Pro Asp Ala Asn Pro Cys Thr Asn Ile Thr Leu Thr Ala Val  
340 345 350

Glu Leu Trp Thr Asp Thr Gly Asp Tyr Val Lys Gln Glu Cys Ser Ser  
355 360 365

Ala Tyr Gly Glu Gly Glu Cys Leu Arg Gln Gln Asn Gly Thr Leu Ala  
370 375 380

Ser Tyr Ser Phe Thr Thr Ile Thr Ser Val Pro Val Thr Ala Tyr  
385 390 395 400

Ser Pro Thr Thr Thr Met Pro Gly Leu Ile Ser Thr Ser Met Asp Thr  
405 410 415

Thr Thr Ser Ile Pro Ile Pro Thr Ile Pro Thr Ser Phe Phe Pro Gly  
420 425 430

## pectinases.ST251

Ala Ser Ala Tyr Ser Thr Leu Met Ala Asn Met  
435 440

<210> 75  
<211> 447  
<212> PRT  
<213> Aspergillus niger

<400> 75

Met Thr Trp Ser Thr Ser Phe Leu Val Ala Thr Ser Leu Leu Ser Ile  
1 5 10 15

Ile Asn Ser Val His Ala Gln Leu Thr Gly Ser Val Gly Pro Leu Thr  
20 25 30

Ser Val Ile Asp Lys Ala Ala Val Lys Thr Cys Asn Val Cys Asp Tyr  
35 40 45

Gly Ala Ser Ser Asp Asn Thr Thr Gly Val Gly Gln Pro Ile Ile Asp  
50 55 60

Ala Phe Thr Asp Cys Gly Ser Gly Gly Leu Ile His Val Pro Glu Gly  
65 70 75 80

Asp Tyr Leu Leu Lys Asp Trp Val Ser Ser Glu Asn Gly Ser Ala Trp  
85 90 95

Ser Ile Gln Leu Asp Gly Val Leu His Trp Asp Ser Ser Pro Ser Ala  
100 105 110

Gln Ser Tyr Ile Phe Ala Ile Thr Gly Gly Ser Asp Ser Glu Leu Ser  
115 120 125

Ser Ser Asn Ala Thr Gly Ala Ile Gln Gly Ser Gly Tyr Leu Tyr His  
130 135 140

Arg His Asn Thr Tyr Thr Ser Pro Arg Met Leu Tyr Ile Ser Gly Cys  
145 150 155 160

## pectinases.ST251

Arg Ile Gly Pro Phe Met Thr Trp Tyr Trp Ser Thr Arg Leu Cys Pro  
165 170 175

Thr Leu Ser Leu Thr Ala Val Thr Met Glu Lys Arg Thr Ile Trp Leu  
180 185 190

Ser Val Val Val Ile Thr Val Val Trp Met Ala Leu Ile Leu Pro Leu  
195 200 205

Leu Leu Asn Val His Ser Ile Ser Gly Asn Ala Asn Ala Thr Ala Ala  
210 215 220

Arg Pro Asn Ser His Asn Phe Leu Ile Glu Asn Ile Tyr Cys Asn Pro  
225 230 235 240

Ser Gly Gly Cys Ala Ile Gly Ser Leu Gly Ser Ser Val Asn Val Thr  
245 250 255

Asn Ile Leu Tyr Arg Asn Val Tyr Thr Trp Asp Ser Asn Gln Met Met  
260 265 270

Met Ile Lys Thr Asn Gly Gly Leu Gly Asn Val Ser Asn Ile Val Phe  
275 280 285

Glu Asn Phe Ile Gly His Gly Asn Val Asn Ser Leu Asp Leu Asp Ser  
290 295 300

Tyr Trp Ser Ser Met Asn Ala Ile Asp Gly Val Gly Ile Tyr Tyr His  
305 310 315 320

Asn Ile Thr Ile Tyr Asn Trp Thr Gly Thr Ala Ile Asp Gly Glu Thr  
325 330 335

Arg Pro Pro Ile Arg Val Ile Cys Pro Glu Asp Met Pro Cys Thr Glu  
340 345 350

Ile Thr Leu Val Gln Ile Asp Leu Leu Val Glu Glu Gly Arg Tyr Asp  
355 360 365

## pectinases.ST251

Glu Tyr Tyr Cys Ala Ile Ala Cys Gly Gly Tyr Cys Leu Asp Ser Ala  
370 375 380

Thr Ser Thr Leu Thr Thr Tyr Thr Thr Thr Tyr Gly Asn Ser Ala  
385 390 395 400

Ser Thr Gly Tyr Glu Ala Pro Thr Met Ala Asp Asp Leu Ala Thr Ala  
405 410 415

Phe Gly Thr Thr Ala Ser Ile Pro Thr Pro Thr Thr Pro Ala Ser Phe  
420 425 430

Phe Phe Pro Gly Val Ala Pro Val Ser Ala Val Ala Gly Ser Ser  
435 440 445

<210> 76

<211> 533

<212> PRT

<213> Aspergillus niger

<400> 76

Met Leu Ser Lys Thr Ser Leu Leu Ser Leu Leu Ser Leu Ala Ala Gly  
1 5 10 15

Val Val Asn Ala Asp Phe Gly Ile Thr Thr Asn Asp Asp Ser Tyr Val  
20 25 30

Ile Asn Ala Asn Ser Pro Asn Ser Leu Val Phe Thr Val Asp Arg Gly  
35 40 45

Ser Cys Asp Ile Thr Ser Ile Val His Tyr Gly Thr Glu Leu Gln Tyr  
50 55 60

Ser Gly Lys Gly Ser His Ile Gly Ser Gly Leu Gly Thr Ala Thr Val  
65 70 75 80

Ser Ala Thr Lys Ser Gly Ala Gly Asp Tyr Ile Lys Val Thr Cys Glu  
85 90 95

## pectinases.ST251

Thr Asp Thr Leu Thr Gln Tyr Met Val Val His Asp Gly Asp Pro Ile  
100 105 110

Ile His Met Ala Thr Tyr Ile Thr Glu Glu Pro Ser Ile Gly Glu Leu  
115 120 125

Arg Phe Ile Ala Arg Leu Asn Ser Asp Val Leu Pro Asn Glu Glu Pro  
130 135 140

Phe Gly Asp Val Ser Asn Thr Ala Asp Gly Glu Ala Ile Glu Gly Ser  
145 150 155 160

Asp Val Phe Leu Val Asp Gly Glu Thr Arg Ser Lys Phe Tyr Ser Ser  
165 170 175

Gln Arg Phe Ile Asp Asp Gln Arg His Cys Ile Ala Gly Asp Glu His  
180 185 190

Arg Val Cys Met Ile Leu Asn Gln Tyr Glu Thr Ser Ser Gly Gly Pro  
195 200 205

Phe His Arg Asp Ile Asn Ser Asn Asn Gly Gly Asp Tyr Asn Ser Leu  
210 215 220

Tyr Trp Tyr Met Asn Ser Gly His Val Gln Leu Glu Ser Tyr Arg Met  
225 230 235 240

Gly Leu His Gly Pro Tyr Ser Met Tyr Phe Ser Arg Ser Gly Thr Pro  
245 250 255

Ser Thr Asp Ile Asp Thr Ser Phe Phe Ala Asp Leu Asp Ile Glu Gly  
260 265 270

Tyr Val Ala Glu Ser Gly Arg Gly Thr Val Ser Gly Thr Ala Ser Gly  
275 280 285

Ala Asp Ser Ser Phe Asp Trp Val Val His Trp Tyr Asn Asp Asp Ala  
290 295 300

## pectinases.ST251

Gln Tyr Trp Thr Tyr Thr Ser Ser Ser Gly Ser Phe Thr Ser Pro Ala  
305 310 315 320

Met Lys Pro Gly Thr Tyr Thr Met Val Tyr Tyr Gln Gly Glu Tyr Val  
325 330 335

Val Ala Thr Ser Glu Val Thr Val Ser Ala Gly Ser Ser Thr Ser Lys  
340 345 350

Asp Ile Ser Gly Ser Val Glu Thr Gly Thr Thr Ile Phe Lys Ile Gly  
355 360 365

Asp Trp Asp Gly Gln Pro Thr Gly Phe Arg Asn Ala Glu Asn Gln Leu  
370 375 380

Arg Met His Pro Ser Asp Ser Arg Met Ser Asp Trp Gly Pro Leu Thr  
385 390 395 400

Tyr Thr Val Gly Ser Ser Ser Leu Thr Asp Phe Pro Met Ala Ile Phe  
405 410 415

Lys Ser Val Asn Ser Pro Val Thr Ile Lys Phe Thr Ala Thr Ser Asp  
420 425 430

Gln Thr Gly Ala Ala Thr Leu Arg Ile Gly Thr Thr Leu Ser Phe Ala  
435 440 445

Gly Gly Arg Pro Gln Ala Thr Ile Asn Asp Tyr Glu Gly Ser Ala Pro  
450 455 460

Ser Ala Pro Thr Asn Leu Asp Ser Arg Gly Val Thr Arg Gly Ala Tyr  
465 470 475 480

Arg Gly Tyr Gly Asp Val Tyr Asp Val Ser Val Pro Glu Gly Thr Ile  
485 490 495

Val Glu Gly Glu Asn Thr Ile Thr Ile Ser Val Ile Ser Gly Ser Ser  
500 505 510

## pectinases.ST251

Gly Asp Asp Phe Leu Ser Pro Asn Phe Leu Asp Ala Val Phe Ile Ile  
515 520 525

Ala Leu Val Asp Asn  
530

<210> 77  
<211> 706  
<212> PRT  
<213> Aspergillus niger

<400> 77

Met Arg Leu Leu His Pro Leu Ile Pro Ala Ser Leu Leu Leu Thr Leu  
1 5 10 15

Thr Ser Ala Thr Leu His Thr Ser Gln Thr Asn Thr Thr Ile Thr Leu  
20 25 30

Thr Asn Asn Arg Leu Thr Ala Asn Phe Ser Lys Ser Gln Gly Arg Ile  
35 40 45

Thr Asp Leu Tyr Leu Asp Asn Gln Asp Leu Leu Gly Pro Gln Ser Gly  
50 55 60

Asp Thr Gly Val Gly Pro Tyr Leu Asp Cys Tyr Cys Ile Pro Ser Gly  
65 70 75 80

Phe Tyr Thr Pro Gly Ser Thr Ser Pro Thr Leu Gln Leu Phe Thr Gly  
85 90 95

Thr Asp Lys Ser Gly Thr Ser Tyr Ala Gly Val Leu Met Asp Glu Thr  
100 105 110

Tyr Pro Pro Thr Gly Gln His Phe Gln Gln Tyr Trp Phe Leu Arg Asp  
115 120 125

Gly Glu Thr Gly Leu His Thr Phe Ser Arg Leu Ala Tyr Tyr Asn Glu  
130 135 140

Thr Thr Pro Tyr Leu Arg Asn Leu Gln Glu Phe Arg Thr Leu Phe Arg

145 150 pectinases.ST251 155 160

Pro Asn Thr Glu Leu Trp Thr His Leu Ser Ser Ser Glu Val Gln Thr  
165 170 175

Ala Pro Leu Pro Ser Lys Lys Ala Val Glu Glu Glu Val Val Val Gln  
180 185 190

Asp Ala Thr Trp Thr Phe Asn Asn Thr Pro Thr Asp Glu Tyr Tyr Val  
195 200 205

Gln Phe Ala Asp Tyr Phe Thr Lys Tyr Thr Phe Ser Asn Ala Trp Arg  
210 215 220

Asp Asn Ser Val His Gly Met Tyr Ala Asp Gly Ser Thr Ser Asn Gly  
225 230 235 240

Ser Thr Phe Gly Ala Trp Leu Val Met Asn Thr Lys Asp Thr Tyr Tyr  
245 250 255

Gly Gly Pro Leu His Ser Asp Leu Thr Val Asp Gly Ile Val Tyr Asn  
260 265 270

Tyr Leu Val Ser Asn His His Gly Glu Gly Thr Pro Asn Ile Thr Tyr  
275 280 285

Gly Phe Asp Arg Thr Phe Gly Pro Gln Tyr Tyr His Phe Asn Gly Gly  
290 295 300

Lys Gly Ser Thr Ala Ser Leu Gln Glu Leu Lys Ser Asp Ala Glu Thr  
305 310 315 320

Leu Ala Asp Pro Ser Trp Asn Val Asp Phe Tyr Asp Ser Ile Ala Lys  
325 330 335

His Val Val Gly Tyr Thr Pro Ser Ser Gln Arg Gly Ser Val Gln Gly  
340 345 350

Lys Ile Lys Leu Pro Lys Gly Ala Thr Arg Pro Ile Ala Val Leu Thr

355	360	365
Val Asp Gly Gln Tyr Phe Gln Asp Asn Ser Val Asn Ser Ser Ser Tyr		
370	375	380
Gln Tyr Trp Ala Glu Ile Asp Asp Ser Gly His Phe Ser Val Asp His		
385	390	395
400		
Val Lys Glu Gly Pro Tyr Arg Leu Thr Val Tyr Ala Asp Gly Ile Phe		
405	410	415
Gly Asp Phe Val Arg Asp Gly Val Gln Val Lys Ala Gly Lys Lys Thr		
420	425	430
435		
Thr Ile Gln Glu Thr Trp Glu Ala Glu Ser Ala Gly Thr Glu Ile Trp		
440		445
Arg Leu Gly Thr Pro Asp Lys Ser Ser Gly Glu Phe Arg His Gly Val		
450	455	460
465		
Ala Arg Asp Pro Thr His Pro Leu His Pro Pro Glu Tyr Leu Ile Tyr		
470		475
480		
Trp Gly Ala Tyr Asp Trp Gln Ser Asp Phe Pro Asp Gly Ile Asn Tyr		
485		490
495		
Thr Ile Gly Thr Ser Asp Pro Ala Thr Asp Leu Asn Thr Val His Trp		
500		510
510		
Ser Val Phe Gly Pro Thr Pro Asn Asp Pro Arg Val Glu Tyr Asp Thr		
515		525
525		
Thr His Asp Trp Thr Ile Asn Phe Pro Leu Ser Glu Asp Asp Leu Ala		
530		540
540		
Glu Arg Ser Lys Ala Thr Leu Thr Ile Gln Leu Ala Gly Ala Lys Ala		
545		555
560		
Ala Ser Gly Asn Thr Asp Val Tyr Asn Ala Ser Glu Pro Tyr Thr Asn		

## pectinases.ST251

565 570 575

Leu Ala Leu Glu Ser Tyr Ile Asn Asp Gln Ala Glu Pro Leu Thr Leu  
580 585 590

Leu Ile Gly Phe Asn Gln Ser Ser Ser Cys Ile Val Arg Ser Ala Val  
595 600 605

Ser Cys Tyr Gln Val Arg Ser Arg Met Glu Phe Pro Ala Asp Trp Leu  
610 615 620

Lys Val Gly Asn Asn Val Leu Thr Leu His Leu Pro Tyr Asn Ala Thr  
625 630 635 640

Asp Thr Glu Thr Ala Ile Leu Pro Ala Thr Val Thr Gly Arg Leu Ile  
645 650 655

Leu Pro Pro Gln Pro Ile Tyr Gly Gln Thr Pro Val Ile Leu Ser Val  
660 665 670

Ile Gly Ser Glu Lys Leu Glu Pro Leu Pro Ala Ala Ser Ile Leu Ile  
675 680 685

Phe Glu Ile Ile Arg His Gln Ser Glu Pro Leu Trp Ser Val Pro Arg  
690 695 700

Ser Ala  
705

<210> 78  
<211> 278  
<212> PRT  
<213> Aspergillus niger

<400> 78

Met Lys Leu Ser Leu Leu Ser Leu Phe Phe Thr Pro Ile Phe Ala Leu  
1 5 10 15

Pro Ser His Leu Thr Pro Arg Asn Asp Ile Pro Pro Phe Phe Leu Leu  
20 25 30

## pectinases.ST251

Ala Gly Asp Ser Thr Thr Ala Val Gln Ser Ser Gly Gly Gly Gly Trp  
35 40 45

Gly Asp Gly Phe Ile Asn Thr Thr Leu His Lys Gly Ala Lys Gly Ile  
50 55 60

Asn Tyr Gly His Asp Gly Ala Thr Thr Val Ser Phe Arg Ser Gly Gly  
65 70 75 80

Asp Trp Ala Thr Val Leu Ser Lys Val Ala Glu Tyr Lys Ser Asp Tyr  
85 90 95

Arg Ala Phe Val Thr Ile Gln Phe Gly His Asn Asp Gln Lys Pro Ala  
100 105 110

Ala Asn Ile Ser Leu Ala Glu Tyr Thr Ser Asn Leu Glu Gln Phe Ala  
115 120 125

Lys Asp Val Lys Asn Ala Gly Gly Thr Pro Ile Leu Val Thr Pro Leu  
130 135 140

Ser Arg Arg Asn Tyr Asp Asn Ser Thr Gly Thr Pro Leu Val Ile Glu  
145 150 155 160

Asn Leu Ala Asp Gln Arg Ala Ala Thr Ile Asp Ala Ala Lys Asn Thr  
165 170 175

Asp Thr Ser Tyr Ile Asp Leu Asn Lys Ala Ser Thr Asp Tyr Leu Asn  
180 185 190

Ser Ile Gly Pro Ala Asp Ala Tyr Thr Tyr Asn Leu Ala Ser Asp Asp  
195 200 205

Tyr Thr His Leu Asn Gly Glu Gly Ser Ile Val Phe Gly Gly Met Val  
210 215 220

Ala Ser Leu Ile Asp Gln Asp Phe Thr Glu Leu Lys Ser Asp Gly Val  
225 230 235 240

## pectinases.ST251

Phe Ile His Asp Gln Trp Leu Val Asp Gly Ile Tyr Gln Ala Glu Asn  
245 250 255

Asp Ser Cys Tyr Ile Ser Ile Leu Glu Tyr Leu Ser Met Ala Tyr Asp  
260 265 270

Leu Ala Asn Pro Met Leu  
275

<210> 79  
<211> 410  
<212> PRT  
<213> Aspergillus niger

<400> 79

Met Ser Val Phe Lys Ala Ser Phe Leu Phe Leu Leu Ser Ser Ser Leu  
1 5 10 15

Val His Gly Val Pro His Ser Ser Arg Ala Ser Arg Ser Gln Gln Cys  
20 25 30

Val Val Pro Pro Leu His Asn Ala Arg Leu Thr Arg Val Ile Ile Phe  
35 40 45

Glu Glu Gly Val Asn Tyr Asn Ile Phe Gln Pro Ile Thr Ala Thr Asn  
50 55 60

Leu Ser Asn Val Glu Ile Arg Met His Gly Asn Leu His Leu Pro Gln  
65 70 75 80

Asn Ile Thr Ala Val Gln Asn Ile Val Ser Asp Gly Thr Ser Thr Trp  
85 90 95

Phe Thr Leu Glu Gly Pro Lys Val Asp Trp Ile Gly Pro Glu Asp Val  
100 105 110

Asn Asn Gly Trp Ile Asp Ser Tyr Gly Gln Pro Trp Trp Asp Ala Asn  
115 120 125

## pectinases.ST251

Pro Ala Gly Ser Ser Gly Ile Asp Asn Arg Pro His Leu Met Ser Phe  
130 135 140

Lys Ser Ser Gln Ala Thr Met Lys Tyr Phe Arg Ser Arg Lys Pro Ile  
145 150 155 160

Ala Trp Asn Val Lys Leu His Gly Gln Asp Ile Thr Val Ser His Ala  
165 170 175

Ile Ile Asp Ala Thr Ser Thr Gly Ser Phe Pro Phe Asn Thr Asp Gly  
180 185 190

Phe Asp Val Glu Gly Thr Asn Ile Gln Ile Thr Asp Ser Ile Met Tyr  
195 200 205

Asn Gly Asp Asp Ala Ile Ala Lys His His Arg Leu Pro Asp Ser Arg  
210 215 220

His Glu His Gly Ser Leu Gly Lys Asp Pro Thr Asp Phe Ala Asn Ile  
225 230 235 240 ^

Ser Asn Ile Arg Phe Asp Asp Val Thr Val Val Asp Gly Leu Tyr Ala  
245 250 255

Ala Arg Phe Lys Ser Trp Ser Gly Gly Thr Gly Leu Val Lys Asn Val  
260 265 270

Thr Trp Asn Asn Ile Arg Val Phe Asn Val Thr Phe Pro Ile Phe Val  
275 280 285

Thr Gln Ser Tyr Ser Asp Gln Gly Ala Ser Arg Ser Gly Thr Val Asn  
290 295 300

Ala Ser Ser Ala Val Met Met Glu Asp Phe Thr Trp Ser Asp Phe Ala  
305 310 315 320

Gly Ser Ile Asn Thr Tyr Gln Pro Gly Asp Gly Ser Cys Val Ser Asp  
325 330 335

## pectinases.ST251

Pro Cys Trp Tyr Asn Val Gly Leu Pro Asn Leu Lys His Thr Glu Ala  
340 345 350

Leu Ile Ile Glu Cys His Thr Ala Gln Ser Cys Lys Asn Phe Val Thr  
355 360 365

Asp Asn Ile Gln Leu Tyr Pro Gln Val Leu Glu Pro Ala Ser Val Ile  
370 375 380

Cys Met Asn Ala Thr Ala Ala Leu Asn Pro Asp Leu Gly Phe Thr Cys  
385 390 395 400

Lys Asn Gly Thr Tyr Ser Pro Leu Ser Asn  
405 410

<210> 80

<211> 319

<212> PRT

<213> Aspergillus niger

<400> 80

Met Pro Phe Phe Arg Ala Lys Ser Ser Lys Arg Gln Ile Met Phe Val  
1 5 10 15

Lys Trp His Phe Leu Val Leu Gly Ala Ile Pro Met Ile Pro Ala Tyr  
20 25 30

Pro Ser Gly Ala Ala Tyr Lys Gly Gly Phe Glu Trp Asp Ser Thr Lys  
35 40 45

Tyr Leu Phe Val Leu Ala Leu Ile Asp Gly Arg Ile Trp Arg Ser Glu  
50 55 60

Gly Gly Pro Asn Trp Val Glu Tyr Leu Thr Gly Cys Gly Leu Glu Glu  
65 70 75 80

Gly Leu Thr Ser Pro Phe Asp Cys Asp Gln Gln Leu Trp Asp Phe Ala  
85 90 95

## pectinases.ST251

Phe Ala Gly Ser Asp Ile Ser Val Glu Tyr Thr Pro Leu His His Asn  
100 105 110

Phe Thr Val Ser Leu Val Asn Gln Val Lys Gln Phe Asn Thr Tyr Ala  
115 120 125

Gln Pro Val Leu Lys Lys Thr Val Asp Gln Ser His Ala Leu Val Ala  
130 135 140

Ile Trp Ile Gly Ile Asn Asp Ile Gly Asp Ser Ser Lys Tyr Asp Val  
145 150 155 160

Asp Phe Pro Thr Phe Tyr Asn Glu Leu Met Asn Thr Leu Phe Ser Ser  
165 170 175

Val Gln Thr Ile Tyr Ser Gln Gly Tyr Arg Ser Tyr Leu Phe Met Asn  
180 185 190

Leu Pro Pro Leu Asp Arg Arg Pro Gly Asn Leu Gly Ser Ala Asp Pro  
195 200 205

Ser Pro Asn Ala Thr Gln Ile Thr Trp Tyr Asn Asp Ala Leu Ala Gln  
210 215 220

His Ala Ser Ala Phe His Asp Arg Tyr Ala Asp Thr Asn Val Met Leu  
225 230 235 240

Phe Asp Ala His Ser Glu Leu Ser Tyr Ile Leu Asp Asn Pro Gly Asp  
245 250 255

Phe Gly Ile Val Asn Ile Thr Asn Phe Cys Ala Gly Tyr Asp Gln Pro  
260 265 270

Asp Ile Ala Trp Asn Tyr Gln Ala Tyr Gly Cys Pro Thr Pro Leu Asp  
275 280 285

Thr Tyr Phe Trp Tyr Asn Ser Gly His Met Thr Ser His Val His Glu  
290 295 300

## pectinases.ST251

Ile Leu Ala Gly Ala Val Glu Arg Lys Leu Glu Glu Trp Ser Asp  
305 310 315

<210> 81  
<211> 317  
<212> PRT  
<213> Aspergillus niger

<400> 81

Met Thr Gly Ile Pro Thr Val Thr Ala Arg Pro Trp Thr Gln Arg Pro  
1 5 10 15

Arg Ala Glu Asn Ser Thr Thr Asn Pro Thr Tyr Phe Phe Thr Leu Cys  
20 25 30

Ala Gln Pro Phe Pro Ser Thr Pro Pro Thr His Ile Thr Asn Asn Ile  
35 40 45

Asp Asp Glu Gly Ile Gly Thr Thr Asn Gly Pro Asn Trp Ile Gly  
50 55 60

Tyr Leu Thr Thr Glu Asn Ala Ser Leu Val Leu Ser Tyr Asn Leu  
65 70 75 80

Ala Ala Gly Gly Ala Thr Ile Asp Asn Ala Leu Val Pro Ala Tyr Pro  
85 90 95

Gly Asp Leu Ala Ser Gln Phe Arg Leu Phe Glu Asp Val Tyr Ala Asp  
100 105 110

Lys Pro Ala Ser Ala Pro Trp Ser Ala Glu Asp Ala Val Phe Gly Val  
115 120 125

Trp Ile Gly Ile Asn Glu Tyr Ile Leu Pro Pro Pro Pro Pro Pro  
130 135 140

Pro Pro Pro Pro Leu Leu Leu His Ser Pro Asp Cys Pro Tyr Thr  
145 150 155 160

Gly Gly Gly Cys Tyr Ile Gly Asn Ala Tyr Tyr Ser Thr Asp Ala Glu

## pectinases.ST251

165

170

175

Thr Tyr Thr Pro Lys Leu Ile Ser Arg Leu Glu Ser Leu Val Glu Glu  
180 185 190

Val Tyr Lys Asn Gly Gly Arg Lys Phe Leu Phe Leu Asn Val Pro Pro  
195 200 205

Thr Ser Arg Ser Pro Leu Phe Leu Glu Gln Gly Glu Glu Val Val Lys  
210 215 220

Gln His Ala Glu Tyr Leu Ser Val Tyr Asn Glu Asn Leu Glu Gly Met  
225 230 235 240

Val Asp Asp Phe Thr Lys Lys Gly Asp Val Thr Thr Val Leu Tyr  
245 250 255

Asp Ser Trp Ser Phe Met Thr Lys Ile Leu Asp Asp Pro Thr Ala Tyr  
260 265 270

Gly Phe Pro Asp Ala Thr Cys Ile Asn Asp Asp Gly Thr Ser Cys Ile  
275 280 285

Trp Trp Asn Asn Tyr His Pro Gly Met Lys Tyr His Leu Leu Gln Ala  
290 295 300

Glu Asp Met Lys Pro Lys Leu Arg Lys Leu Gly Gly Trp  
305 310 315

<210> 82

<211> 536

<212> PRT

<213> Aspergillus niger

<400> 82

Met Asp Phe Pro Arg Leu Leu Leu Ala Leu Cys Phe Leu Leu Thr Phe  
1 5 10 15

Ser Leu Thr Ser Ala Tyr Asp Ala Pro Leu Val Thr Leu Asp Tyr Gly  
20 25 30

## pectinases.ST251

Thr Phe Gln Gly Ser Tyr Asp Ala Thr Tyr Asn Leu Ser Tyr Phe Arg  
35 40 45

Lys Ile Pro Phe Ala Ala Pro Ala Thr Gly Glu Asn Arg Phe Arg Ala  
50 55 60

Pro Gln Pro Pro Leu Asn Ile Thr Asn Gly Thr Tyr Asp Thr Asp Gln  
65 70 75 80

Ser Phe Asp Met Cys Pro Gln Arg Thr Val Asn Gly Ser Glu Asp Cys  
85 90 95

Leu Tyr Leu Gly Leu Tyr Ser Arg Pro Trp Asp Thr Ser Ser Ser Thr  
100 105 110

Thr Ser Arg Pro Val Leu Val Val Phe Tyr Gly Gly Phe Ile Glu  
115 120 125

Gly Asp Ala Leu Phe Gly Met Pro Pro Asn Ala Tyr Pro Val Leu Asn  
130 135 140

Val Ser Thr Leu Asn Asp Tyr Ile Val Val Tyr Thr Asn Tyr Arg Val  
145 150 155 160

Asn Ala Phe Gly Phe Leu Pro Gly Gln Ala Ile Lys Asp Ser Pro Thr  
165 170 175

Ser Asp Leu Asn Pro Gly Leu Leu Asp Gln Gln Tyr Ala Leu Lys Trp  
180 185 190

Val Lys Ser His Ile His Arg Phe Gly Gly Asn Pro Asn Asn Val Thr  
195 200 205

Ile Trp Gly Gln Ser Ala Gly Gly Ser Val Val Ala Gln Ile Leu  
210 215 220

Ala Asn Gly Arg Gly Ser Asn Pro Lys Leu Phe Ser Lys Ala Leu Ala  
225 230 235 240

## pectinases.ST251

Ser Ser Pro Phe Trp Pro Lys Thr Tyr Ala Tyr Asn Ala Pro Gln Ala  
245 250 255

Glu Ala Ile Tyr Thr Gln Leu Val Asn Leu Thr Asn Cys Thr Thr Ala  
260 265 270

Ser Asp Thr Leu Lys Cys Leu Lys Glu Val Asp Val Gln Ser Ile Arg  
275 280 285

Asp Ala Ser Leu Ile Ile Asp Ala Asp Asn Thr Tyr Thr Thr Ser Ser  
290 295 300

Tyr Thr Trp Ala Pro Val Ile Asp Gly Thr Phe Leu Ile Glu Pro Leu  
305 310 315 320

Thr Ser Ala Thr Ala Ser Asn Thr Leu Lys Thr Asp Leu Ile Trp Gly  
325 330 335

Met Tyr Asn Ala His Glu Gly Glu Asn Phe Ile Pro Pro Gly Leu Glu  
340 345 350

Asp Thr Thr Thr Asn Gly Phe Asn Ser Ser Leu Ala Ser Phe His  
355 360 365

Asn Trp Leu Thr Gly Phe Leu Pro Gly Leu Asp Thr Ser Asp Ile Asn  
370 375 380

Leu Ile Glu Ser Lys Tyr Tyr Pro Val Ser Gly Thr Ala Glu Thr Leu  
385 390 395 400

Ser Tyr Asn Thr Thr Phe Val Arg Ala Gly Leu Val Tyr Arg Asp Val  
405 410 415

Val Leu Ala Cys Pro Ala Tyr Trp Val Ala Ser Ala Ala Gly Glu Lys  
420 425 430

Gly Tyr Val Gly Glu Tyr Thr Ile Pro Pro Ala Arg His Gly Ser Asp  
435 440 445

## pectinases.ST251

Thr Glu Trp Trp Asp Thr Val Ser Thr Val Gln Gln Thr Asp Pro Leu  
450 455 460

Ile Tyr Asp Gly Tyr Ala Gly Ala Phe Ala Ser Phe Phe Gln Thr Gly  
465 470 475 480

Asp Pro Asn Ala His Lys Leu Thr Asn Gly Ser Glu Pro Gly Val Pro  
485 490 495

Glu Val Gln Gln Thr Ala Glu Glu Phe Val Ile Ala Thr Glu Gly Phe  
500 505 510

Glu Asn Val Gly Leu Gly Glu Leu Glu Asp Arg Cys Ala Phe Trp Lys  
515 520 525

Ser Val Gly Lys Lys Ile Pro Ile  
530 535

<210> 83  
<211> 378  
<212> PRT  
<213> Aspergillus niger

<400> 83

Met Val Thr Ser Ser Ser Val Ile Val Leu Thr Leu Trp Ala Ala Leu  
1 5 10 15

Val Ser Ala Ser Pro Val Ala Asp Pro Leu Val Thr Pro Ala Pro Lys  
20 25 30

Leu Glu Asp Leu Glu Lys Arg Ala Thr Ser Cys Thr Phe Ser Gly Ser  
35 40 45

Glu Gly Ala Ser Ser Ala Ser Lys Ser Lys Thr Ser Cys Ser Thr Ile  
50 55 60

Val Leu Ser Asp Val Ala Val Pro Ser Gly Thr Thr Leu Asp Leu Thr  
65 70 75 80

## pectinases.ST251

Asp Leu Asn Asp Gly Thr His Val Ile Phe Glu Gly Glu Thr Thr Phe  
85 90 95

Gly Tyr Glu Glu Trp Ser Gly Pro Leu Val Ser Val Ser Gly Thr Asp  
100 105 110

Ile Thr Val Thr Gly Ala Asp Gly Ala Tyr Leu Asn Gly Asp Gly Ser  
115 120 125

Arg Trp Trp Asp Gly Glu Gly Ser Asn Gly Gly Lys Thr Lys Pro Lys  
130 135 140

Phe Phe Tyr Ala His Asp Leu Thr Ser Ser Thr Ile Ser Gly Ile Tyr  
145 150 155 160

Ile Gln Asn Ser Pro Val Gln Val Phe Ser Ile Asp Gly Ser Thr Tyr  
165 170 175

Leu Thr Met Glu Asp Ile Thr Ile Asp Asn Thr Asp Gly Asp Asp Gly  
180 185 190

Glu Ala Ala Asn Thr Asp Gly Phe Asp Ile Gly Asp Ser Thr Tyr Ile  
195 200 205

Thr Ile Thr Gly Ala Asn Val Tyr Asn Gln Asp Asp Cys Val Ala Val  
210 215 220

Asn Ser Gly Glu Asn Ile Tyr Phe Ser Gly Gly Val Cys Ser Gly Gly  
225 230 235 240

His Gly Leu Ser Ile Gly Ser Val Gly Gly Arg Ser Asp Asn Thr Val  
245 250 255

Lys Asn Val Thr Phe Tyr Asp Ser Glu Ile Lys Ser Ser Gln Asn Gly  
260 265 270

Val Arg Ile Lys Thr Ile Tyr Gly Asp Thr Gly Ser Val Ser Glu Val  
275 280 285

## pectinases.ST251

Thr Tyr Lys Glu Ile Thr Leu Ser Asp Ile Thr Asp Tyr Gly Ile Val  
290 295 300

Val Glu Gln Asn Tyr Asp Asp Thr Ser Lys Ser Pro Thr Asp Gly Ile  
305 310 315 320

Thr Ile Glu Asp Phe Val Leu Asp Asn Val Gln Gly Ser Val Glu Ser  
325 330 335

Ser Gly Thr Asn Ile Tyr Ile Val Cys Gly Ser Asp Ser Cys Thr Asp  
340 345 350

Trp Thr Trp Thr Asp Val Asp Val Ser Gly Gly Lys Thr Ser Ser Asp  
355 360 365

Cys Glu Asn Val Pro Asp Asp Ile Ser Cys  
370 375

<210> 84  
<211> 558  
<212> PRT  
<213> Aspergillus niger

<400> 84

Met Leu Leu Asp Lys Leu Ser Val Leu Ser Phe Leu Gly Leu Ala Pro  
1 5 10 15

Ile Phe Ala Ala Ala Gln Leu Ser Gly Ser Val Gly Pro Leu Thr Ser  
20 25 30

Ala Ser Thr Lys Ala Ala Thr Lys Thr Cys Asn Val Leu Asp Tyr Gly  
35 40 45

Ala Lys Ala Asp Lys Ser Thr Asp Leu Gly Ala Pro Leu Ala Ser Ala  
50 55 60

Phe Ala Asp Cys Lys Ser Gly Gly Leu Val Tyr Val Pro Ser Gly Asp  
65 70 75 80

## pectinases.ST251

Tyr Ala Leu Ser Thr Trp Ala Arg Leu Ser Gly Gly Glu Ala Trp Ala  
85 90 95

Leu Gln Ile Asp Gly Ile Ile Tyr Arg Thr Gly Thr Asp Gly Gly Asn  
100 105 110

Met Ile Tyr Ile Glu His Ser Ser Asp Phe Glu Leu Phe Ser Ser Thr  
115 120 125

Ser Glu Gly Ala Met Gln Gly Leu Gly Tyr Glu Phe His Ala Asp Asp  
130 135 140

Asn Trp Ser Gly Pro Arg Leu Leu Arg Leu Tyr Glu Val Thr Asp Phe  
145 150 155 160

Ser Val His Asp Phe Ile Leu Val Asp Ser Pro Ser Phe His Phe Ser  
165 170 175

Leu Asp Thr Cys Thr Asn Gly Glu Ile Tyr Asn Met Ala Ile Arg Gly  
180 185 190

Gly Asn His Gly Gly Leu Asp Gly Ile Asp Val Trp Ser Asn Asn Ile  
195 200 205

Trp Val His Asp Val Glu Val Thr Asn Lys Asp Glu Cys Val Thr Val  
210 215 220

Lys Ser Pro Ser Lys Asn Ile Leu Ile Glu Ser Ile Tyr Cys Asn Trp  
225 230 235 240

Ser Gly Gly Cys Gly Met Gly Ser Phe Gly Ser Asp Thr Asn Val Ser  
245 250 255

Asp Ile Thr Tyr Arg Asn Ile Tyr Thr Trp Ser Ser Asn Asn Met Met  
260 265 270

Leu Ile Lys Ser Asn Gly Gly Ser Gly Phe Val Glu Asn Val Leu Leu  
275 280 285

## pectinases(ST251)

Glu Asn Phe Ile Gly His Gly Asn Ala Tyr Ser Leu Asp Ile Asp Ser  
290 295 300

Tyr Trp Ala Ser Met Ser Ala Val Asp Gly Asp Gly Val Gln Leu Ser  
305 310 315 320

Asn Ile Thr Val Lys Asn Trp Lys Gly Thr Glu Ala Tyr Gly Ala Glu  
325 330 335

Arg Gly Pro Val Lys Val Val Cys Ala Asp Gly Ala Pro Cys Tyr Asp  
340 345 350

Ile Thr Ile Glu Asp Phe Ala Met Trp Thr Glu Glu Gly Asp Ser Gln  
355 360 365

Trp Tyr Ser Cys Glu Ser Ala Tyr Gly Ser Gly Tyr Cys Leu Gln Asp  
370 375 380

Ser Asp Asp His Val Ser Tyr Ser Val Thr Thr Ser Thr Val Ser Ser  
385 390 395 400

Ala Pro Ser Gly Tyr Ser Ala Thr Ser Met Ala Ala Asp Leu Thr Thr  
405 410 415

Asp Phe Gly Ser Thr Val Ser Ile Pro Ile Pro Thr Ile Pro Thr Ser  
420 425 430

Phe Tyr Pro Gly Ala Thr Pro Tyr Ser Ala Leu Met Ala Asn Ser Ala  
435 440 445

Ser Thr Ala Ala Ala Ser Ser Ile Ala Ser His Ala Thr Val His Ser  
450 455 460

Ser Ser Ala Ser Val Ala Ala Ser Val Pro Ser Ala Val Ala Pro Ser  
465 470 475 480

Glu Ser Ile Pro Ala Ala Thr Ser Ala Val Val Ser Ser Ala Ala Ala  
485 490 495

## pectinases.ST251

Ile Ala Pro Ser Pro Ala Val Gly Ala Gln Glu Gly Ser Thr Thr Ser  
500 505 510

Ala Pro Ser Phe Ala Ala Pro Ser Gly Ala Gly Asn Ser Pro Gln Gly  
515 520 525

Pro Thr Gly Ala Ser Gly Phe Gly Glu Lys Gly Gln Gln Gly Glu Gln  
530 535 540

Gly Glu Gln Gly Glu Gln Gly Glu Gln Gly Val Cys Tyr Val  
545 550 555

<210> 85

<211> 350

<212> PRT

<213> Aspergillus niger

<400> 85

Met Ile Tyr Ser Leu Leu Leu Ser Ala Leu Pro Leu Leu Ser Ser Ala  
1 5 10 15

Ala Leu Thr Tyr Arg Gly Ala Asp Ile Ser Ser Leu Leu Ile Glu Glu  
20 25 30

Asp Ala Gly Ile Ser Tyr Lys Asn Leu Asn Gly Glu Thr Gln Ala Leu  
35 40 45

Glu Asp Ile Leu Val Asn Asn Gly Val Asn Ser Ile Arg Gln Arg Val  
50 55 60

Trp Val Asp Pro Ser Asp Gly Ser Tyr Asp Leu Asp Tyr Asn Leu Lys  
65 70 75 80

Leu Ala Lys Arg Val Gln Ala Ala Gly Met Ser Ile Tyr Leu Asp Leu  
85 90 95

His Leu Ser Asp Thr Trp Ala Asp Pro Ser Asp Gln Thr Thr Pro Thr  
100 105 110

Gly Trp Ser Thr Thr Asp Ile Asp Thr Leu Thr Trp Gln Leu Tyr Asn

115 pectinases. ST251 120 125

Tyr Thr Leu Asp Val Cys Asn Thr Phe Ala Glu Asn Asp Ile Asp Ile  
 130 135 140

Glu Ile Val Ser Ile Gly Asn Glu Ile Ser Ser Gly Leu Leu Trp Pro  
145 150 155 160

Leu Gly Lys Thr Ser Asn Tyr Asp Asn Ile Ala Lys Leu Leu His Ser  
165 170 175

Gly Ala Trp Gly Val Lys Asp Ser Asn Gln Ala Thr Thr Pro Lys Ile  
180 185 190

Met Ile His Leu Asp Asn Gly Trp Asp Trp Glu Glu Gln Glu Tyr Phe  
195 200 205

Tyr Lys Thr Val Leu Ala Thr Gly Ser Leu Leu Ser Thr Asp Phe Asp  
 210 215 220

Leu Met Gly Val Ser Tyr Tyr Pro Phe Tyr Ser Ser Glu Ala Thr Leu  
225 230 235 240

Ser Ala Leu Gln Thr Ser Leu Thr Asn Met Gln Ser Asn Tyr Asp Lys  
245 250 255

Ser Val Val Val Val Glu Thr Asn Trp Pro Val Ser Cys Pro Asp Pro  
260 265 270

Glu Tyr Ser Phe Pro Ser Asp Leu Ser Ser Ile Pro Phe Ser Ala Ala  
 275 . . 280 . . 285

Gly Gln Glu Glu Phe Leu Glu Lys Leu Ala Glu Val Val Glu Gly Val  
290 295 300

Thr Asp Gly Leu Gly Ile Tyr Tyr Trp Glu Pro Ala Trp Val Asp Asn  
 305 310 315 320

Ala Ala Leu Gly Ser Ser Cys Ala Asp Asn Leu Met Val Asp Ile Asp

## pectinases.ST251

325

330

335

Thr Asp Glu Val Leu Glu Ser Val Thr Val Phe Glu Asp Leu  
340 345 350

<210> 86

<211> 476

<212> PRT

<213> Aspergillus niger

<400> 86

Met Thr Leu Leu Arg His Leu Leu Thr Ala Thr Ala Leu Leu Gly Ala  
1 5 10 15

Ser Val Gln Ala Ala Gln Gly Val Thr Gly Ser Pro Phe Gly Phe Ala  
20 25 30

Ser Gly Thr Thr Gly Gly Asp Ala Thr Pro Ala Ala Pro Ser Asp  
35 40 45

Ile Ser Gln Leu Lys Thr Trp Leu Ser Asp Ser Thr Pro Arg Val Ile  
50 55 60

Leu Ile Asp Lys Glu Phe Asn Phe Leu Gly Ser Glu Gly Lys Cys Thr  
65 70 75 80

Asn Cys Glu Cys Cys Lys Pro Ala Ser Asn Thr Cys Gly Ser Ser Gly  
85 90 95

Gln Asn Ala Val Lys Gln Asn Gly Ser Asp Trp Cys Gly Ser Tyr Pro  
100 105 110

Thr Leu Thr Cys Thr Tyr Asp Asn Ala Gly Ile Glu Gly Leu Glu Val  
115 120 125

Ala Ser Asn Lys Ser Ile Val Gly Val Gly Ser Ser Gly Val Leu Arg  
130 135 140

Gly Lys Gly Leu Arg Leu Val Asn Gly Val Ser Asn Ile Ile Ile Gln  
145 150 155 160

## pectinases.ST251

Asn Ile His Ile Thr Glu Leu Asn Pro Glu Phe Ile Trp Gly Gly Asp  
165 170 175

Ala Ile Thr Leu Asp Gly Thr Asn Asn Val Trp Ile Asp His Val Lys  
180 185 190

Ile Asn Leu Ile Gly Arg Gln Met Phe Val Ala Gly Tyr Glu Ala Ser  
195 200 205

His Ser Val Thr Ile Ser Asn Ser Glu Phe Asp Gly Glu Thr Ser Trp  
210 215 220

Ser Ala Thr Cys Asp Gly His His Tyr Trp Thr Val Leu Gly Tyr Gly  
225 230 235 240

His Asn Asp Lys Ile Thr Phe Ala Asn Asn Tyr Ile His His Thr Ser  
245 250 255

Gly Arg Ser Pro Lys Leu Glu Phe Asn Ser Phe Trp His Ala Tyr Asn  
260 265 270

Asn Tyr Trp Tyr Asn Asn Thr Gly His Ala Phe Asp Val Gly Lys Asn  
275 280 285

Thr Arg Ala Leu Ile Glu Gly Asn Val Met Val Gln Val Asp Thr Pro  
290 295 300

Leu Leu Ala Asp Ser Asn Pro Gly Ala Val Phe Ala Val Asn Thr Ser  
305 310 315 320

Asp Val Ser Thr Cys Thr Ser Thr Leu Gly Arg Thr Cys Val Pro Asn  
325 330 335

Thr Leu Ile Ser Ser Gly Thr Leu Ser Gly Ser Asp Ser Ser Val Ile  
340 345 350

Ser Ser Trp Pro Ser Gly Glu Ser Asp Val Thr Val Met Ala Ala Ser  
355 360 365

## pectinases.ST251

Lys Val Ala Ser Tyr Val Lys Ala Asn Ala Gly Ile Gly Lys Leu Gly  
370 375 380

Asn Gly Ser Gly Ser Ser Ser Thr Val Gly Ala Ala Ala Thr Ser Ala  
385 390 395 400

Val Ala Lys Arg Ala Asp Ser Asp Asp Ala Pro Phe Val Pro Ala Tyr  
405 410 415

Ser Glu Ala Gly Pro Gly Ala Ser Ala Val Pro Thr Gln Pro Ser Trp  
420 425 430

Ser Trp Arg Thr Val Thr Asn Gly Pro Ala Pro Thr Gly Ala Pro Ser  
435 440 445

Asp Ser Pro Ser Ala Pro Gln Gly Leu Gly Ala Pro Val Gln Ala Ser  
450 455 460

Asn Lys His His His Gln Gly His Gly Arg Gly Tyr  
465 470 475

<210> 87

<211> 437

<212> PRT

<213> Aspergillus niger

<400> 87

Met Thr Pro Asn Trp Ser Lys Leu Trp Thr Phe Ile Ala Asn Pro Lys  
1 5 10 15

Asp Pro Ser Ser Ser Ser Pro Ser Pro Tyr Thr Leu Arg Arg Ile Ile  
20 25 30

Lys Ser Leu Ser Leu Leu Thr Val Phe Ser Ile Phe Leu Tyr Ala Leu  
35 40 45

Tyr Ile His Phe Gln Pro Ser Ile Ile Pro Gln Thr Pro Asp Leu Pro  
50 55 60

## pectinases.ST251

Asp Pro Asp Leu Pro Pro Ser Pro Glu Asp Ser Tyr Lys Ser Ile Tyr  
65 70 75 80

Gly Tyr Pro Pro Thr Asn Pro Thr Ile Pro Pro Leu His Ile His Asp  
85 90 95

Pro Ser Ile Leu Tyr Asp Leu Pro Thr Asn Thr Tyr Tyr Ala Tyr Gly  
100 105 110

Ser Gly Pro His Ile Pro Ile His Ser Ala Pro Thr Leu Gln Gly Pro  
115 120 125

Trp Thr Lys Val Gly Thr Val Leu Asp Ala Asp Ser Ile Leu Pro Lys  
130 135 140

Gly Asp Arg Lys Ala Pro Trp Ala Pro Thr Ala Leu Val His Asp Gly  
145 150 155 160

Thr Phe Tyr Val Phe Tyr Ala Thr Ser His Ser Gly Cys Arg Asp Ser  
165 170 175

Ala Ile Gly Val Ala Thr Ser Thr Ser Pro Gly Pro Gly Gly Trp Glu  
180 185 190

Asp His Gly Ala Ile Ala Ile Ser Gly Arg Gly Glu Arg Gly Lys Glu  
195 200 205

Tyr Pro Phe Asp Arg Ala Asn Ala Ile Asp Val Ser Val Val Val Asp  
210 215 220

Tyr Thr Asp Thr Gln Thr Gln Thr Glu Pro Ser Glu Gly Glu Ile Ser  
225 230 235 240

Leu Glu Glu Gly Lys Lys Gly Lys Gly Arg Gly Tyr Met Thr Phe Gly  
245 250 255

Ser Phe Trp Thr Gly Ile Trp Gln Val Pro Leu Lys Pro Asn Leu Leu  
260 265 270

## pectinases.ST251

His Met Asp Lys Gln Gly Glu Glu Glu Lys Arg Val Lys His Leu Ala  
275 280 285

His Glu Pro Ala Ala Ile His Pro Pro Thr Lys Lys Ala Asp Gly Leu  
290 295 300

Cys Gly Asp Thr Thr Gly Met His Pro Ile Glu Gly Ala Phe Ile Ser  
305 310 315 320

Tyr His Glu Pro Trp Trp Tyr Leu Trp Phe Ser Trp Gly Lys Cys Cys  
325 330 335

His Phe Asp Pro Glu Lys Leu Pro Arg Ala Gly Leu Asp Ile Arg Val  
340 345 350

Gly Arg Ser Ser Ser Pro Gln Gly Pro Phe Val Asp Lys Glu Gly Lys  
355 360 365

Asp Leu Val Asp Gly Gly Glu Ile Val Tyr Gly Ser Asn Gly Asp  
370 375 380

Val Tyr Ala Pro Gly Gly Gln Gly Val Leu Ser Gly Glu Val Glu Gly  
385 390 395 400

Asp Val Leu Tyr Tyr His Tyr Leu Asn Ile Ser Val Gly Tyr Glu Phe  
405 410 415

Lys Glu Ala Arg Leu Gly Tyr Asn Tyr Leu Lys Tyr Val Asp Gly Trp  
420 425 430

Pro Val Pro Leu Ser  
435

<210> 88  
<211> 366  
<212> PRT  
<213> Aspergillus niger

<400> 88

pectinases.ST251

Met	Leu	Pro	Ser	Leu	Leu	Ser	Val	Leu	Phe	Phe	Leu	Leu	Tyr	Ala	Val
1				5			10						15		
Asn	Ala	Val	Pro	Leu	Ala	Pro	Arg	Ala	Ser	Ala	Leu	Ala	Gly	Ile	Asp
		20				25							30		
Thr	Lys	Ser	Phe	Ser	Lys	Thr	Lys	Asp	Tyr	Pro	Leu	Pro	Asn	Leu	Gly
	35				40							45			
Asn	Ile	Val	Ala	His	Asp	Pro	Asn	Val	Ile	Gln	His	Asp	Gly	Tyr	Phe
	50				55					60					
Tyr	Leu	Tyr	Lys	Gly	Gly	Val	His	Ile	Pro	Ile	His	Arg	Ala	Arg	Ser
	65				70				75			80			
Leu	Ser	Gly	Pro	Trp	Glu	Gln	Val	Gly	Thr	Val	Leu	Asp	Asp	Ser	Ser
		85				90						95			
Val	Ile	Pro	Lys	Gln	Asn	Arg	Ser	Arg	Pro	Trp	Ala	Pro	Thr	Thr	Ile
	100					105						110			
Gln	His	Asp	Asn	Arg	Phe	Tyr	Cys	Phe	Tyr	Ala	Ile	Ser	Glu	Asn	Gly
	115					120					125				
Ser	Arg	Asp	Ser	Ala	Ile	Gly	Val	Ala	Ser	Ser	Asp	Thr	Pro	Val	Gly
	130				135				140						
Gly	Asn	Trp	Thr	Asp	His	Gly	Ala	Val	Val	Asn	Thr	Gly	Lys	Gly	Asp
	145				150				155			160			
Leu	Ser	Asp	Ile	Tyr	Pro	Tyr	Ser	Val	Ser	Asn	Ala	Ile	Asp	Gly	Ala
		165				170						175			
Phe	Ile	Thr	Asp	Gln	Gln	Thr	Gly	Gln	Ser	His	Leu	Leu	Tyr	Gly	Ser
	180					185						190			
Tyr	Trp	His	Gly	Ile	Phe	Ser	Val	Pro	Leu	Ala	Asp	Asp	Leu	Leu	Ser
	195					200					205				

## pectinases.ST251

Val Lys Thr Pro Lys Thr Pro Asn Ala Thr Asn Leu Ala Tyr Ile Pro  
210 215 220

Asp Ala Lys Ser Lys Pro Ile Glu Gly Ser Phe Met Thr Tyr Lys Ala  
225 230 235 240

Pro Tyr Tyr Tyr Leu Trp Phe Ser His Gly Lys Cys Cys His Phe Asp  
245 250 255

Ile His Ala Phe Pro Pro Met Gly Asp Glu Tyr Asn Ile Arg Val Gly  
260 265 270

Arg Ser Lys Ser Ala Thr Gly Pro Phe Val Asp Lys Asp Gly His Asp  
275 280 285

Thr Leu Lys Gly Gly Thr Ile Val Tyr Gly Ser Asn His Gly Ile  
290 295 300

Val Tyr Ala Pro Gly Gly Val Gly Val Leu Ile Asn Asn Gly Ser Glu  
305 310 315 320

Ala Asp Val Leu Tyr Tyr His Tyr Leu Asn Thr Thr Ser Gly Phe Ala  
325 330 335

Gln Gly Asp Ala His Leu Gly Trp Asn Tyr Leu His Tyr Val Asn Gly  
340 345 350

Trp Pro Val Ala Val Glu Gly Tyr Val Asn Ala Asn Gly Lys  
355 360 365

<210> 89  
<211> 318  
<212> PRT  
<213> Aspergillus niger

<400> 89

Met Leu Ser Phe Val Leu Leu Cys Val Ala Leu Val Asn Ala Tyr  
1 5 10 15

Ser Asp Pro Gly Ala Cys Ser Gly Thr Cys Trp Ala His Asp Pro Asn

## pectinases.ST251

20

25

30

Val Ile Arg Arg Val Ser Asp Gly Thr Tyr Phe Arg Phe Ser Thr Gly  
35 40 45

Gly Gly Val His Ile Ser Ser Ala Ser Ala Ile Thr Gly Pro Trp Thr  
50 55 60

Asp Leu Gly Tyr Ala Leu Pro Asn Gly Ser Ile Val Thr Val Gly Asn  
65 70 75 80

Ala Ser Asn Leu Trp Ala Pro Asp Val His Tyr Val Asp Gly Thr Tyr  
85 90 95

Tyr Met Tyr Tyr Ala Ser Ser Thr Leu Gly Ser Arg Asp Ser Thr Ile  
100 105 110

Gly Val Ala Thr Ser Thr Leu Glu Ala Asp Ser Trp Thr Asp His  
115 120 125

Gly Glu Ile Gly Val Thr Ser Ser Ser Ser Thr Pro Tyr Asn Ala Ile  
130 135 140

Asp Pro Asn Trp Ile Thr Ile Gly Ser Thr Pro Tyr Leu Gln Phe Gly  
145 150 155 160

Ser Tyr Trp Gln Gly Leu Tyr Gln Val Glu Met Thr Asp Ser Leu Ser  
165 170 175

Ala Ser Ser Ser Thr Pro Thr Asn Leu Ala Tyr Asn Ala Ser Gly Asn  
180 185 190

His Ala Ile Glu Ala Ser Tyr Leu Tyr Glu Tyr Gly Gly Tyr Tyr Tyr  
195 200 205

Leu Thr Phe Ser Ser Gly Lys Ala Gln Gly Tyr Thr Thr Ser Leu Pro  
210 215 220

Ala Gln Gly Asp Glu Tyr Arg Ile Val Val Cys Arg Ser Lys Thr Gly

225	230	pectinases. ST251	235	240
Thr Gly Asn Phe Val Asp Lys Asp Gly Val Ser Cys Leu Asn Ser Gly				
	245		250	255
Gly Thr Thr Val Leu Ala Ser His Asp Tyr Val Tyr Gly Pro Gly Gly				
	260		265	270
Gln Gly Ile Ile Asn Thr Thr Ser His Gly Ile Val Val Tyr Tyr His				
	275		280	285
Tyr Ala Asn Lys Asn Ile Gly Leu Ala Val Asp Asp Tyr Gln Phe Gly				
	290		295	300
Trp Asn Thr Leu Thr Trp Thr Asp Gly Trp Pro Val Val Ala				
	305		310	315
<210> 90				
<211> 494				
<212> PRT				
<213> Aspergillus niger				
<400> 90				
Met Leu Thr Ser Gln Pro Leu Ser Pro Asn Cys Pro His Arg Arg Ala				
	1		5	10
				15
Tyr His His Leu Pro Ser Leu Leu Glu Val Leu Ile His Ser Pro His				
	20		25	30
Glu Pro Leu Ser Leu Thr Leu Lys Thr Leu Tyr Leu Phe Ser Thr Asn				
	35		40	45
Gly Ser Pro His Trp Leu Ser Tyr Leu Thr Pro Gln Pro Ser Pro Leu				
	50		55	60
Thr Thr Lys His Arg Val Val Asn Asp Thr Leu Gln Ser Glu Asp Tyr				
	65		70	75
				80
Ser Leu Val Arg Ala Arg Gly Trp Gln His Pro Arg Lys Tyr Ile Gln				
	85		90	95

## pectinases.ST251

Val Asp Thr Met Lys Gly Leu Pro Ser Leu Leu Asn Ser Ser Ser Thr  
100 105 110

Lys Lys Trp Thr Gln Ser Thr Pro Ser Thr Gly Glu Gly Glu Asn Glu  
115 120 125

Ser Gly Ser Thr Ile Ser Pro Thr Lys Pro Pro Glu Pro Ser Thr Pro  
130 135 140

Pro Gly Gly Ser Asn Thr Ser Met Ile Trp Thr Arg Lys Lys Ile Ile  
145 150 155 160

Trp Leu Ile Thr Leu Ile Ala Leu Ser Val Ala Ile Ile Val Val Val  
165 170 175

Ile Thr Val Pro Val Val Leu Leu Asp Asp Lys His Asn Asp Asp  
180 185 190

Pro Ser Tyr Tyr Asn Ser Ala Asn Arg Pro Val Arg Val Val His Asp  
195 200 205

Phe Pro Asp Pro Gly Leu Ile Gln Val Asn Ser Thr Trp Tyr Ala Tyr  
210 215 220

Ala Thr Val Ala Thr Pro Asp Asn Pro Asp Val Pro His Val Pro Val  
225 230 235 240

Ser Thr Ser Arg Asn Phe Ser Ser Trp Thr Trp Leu Gln Gly Tyr Asp  
245 250 255

Val Met Pro Ala Ile Ser Ser Trp Glu Thr Asn Met Asn Gln Tyr Ala  
260 265 270

Pro Asp Val Ile Gln Arg Lys Asp Gly His Phe Val Leu Tyr Tyr Ser  
275 280 285

Gly Glu Leu Lys Asp Trp Leu Arg His His Cys Val Gly Ala Ala Val  
290 295 300

## pectinases.ST251

Ser Asn Gly Thr Ser Pro Leu Gly Pro Tyr Ile Pro His Asn Thr Thr  
305 310 315 320

Leu Ala Cys Pro Arg Asp His Gly Gly Ala Ile Asp Pro Ala Pro Phe  
325 330 335

Arg Asp Val Asn Gly Thr Leu Tyr Val Val Tyr Lys Val Asp Gly Asn  
340 345 350

Ser Ile Gly His Gly Gly Cys Asn Asn Gly Lys Lys Pro Ile Val  
355 360 365

Ser Thr Pro Ile Met Leu Gln Gln Leu Lys Asp Asp Gly Val Thr Pro  
370 375 380

Val Gly Asp Pro Val Glu Ile Leu Thr Asn Glu Lys Val Asp Gly Pro  
385 390 395 400

Leu Val Glu Ala Pro Ala Ile Ile Arg Thr Asp Arg Gly Ile Tyr Tyr  
405 410 415

Leu Phe Phe Ser Ser His Cys Phe Thr Ser Ser Lys Tyr Ser Val Lys  
420 425 430

Tyr Ala Trp Ser Thr Ser Leu Lys Gly Pro Tyr Thr Arg Ala Glu Arg  
435 440 445

Pro Leu Phe Arg Ser Gly Asp Phe Gly Leu Lys Ser Pro Gly Gly Ala  
450 455 460

Thr Ala Ser Val Asp Gly Ser Arg Ile Val Phe His Ala Phe Cys Gly  
465 470 475 480

Asp Tyr Arg Cys Arg Val Ser Gly Lys Pro Ser Ile Leu Ser  
485 490

<210> 91  
<211> 251

## pectinases.ST251

&lt;212&gt; PRT

&lt;213&gt; Aspergillus niger

&lt;400&gt; 91

Met Trp Thr His Leu Pro Ser Leu Cys Ala Leu Gly Leu Thr Leu Ile  
1 5 10 15

Thr Ser Val Ile Thr Ser Pro Ile Glu Ile Arg Ala Thr Gly Pro Trp  
20 25 30

Leu Ala Leu Asp Thr Asp Phe Pro Asp Pro Gly Phe Val Gln Ala Asp  
35 40 45

Asp Gly Thr Trp Tyr Ala Phe Gly Thr Asn Gly Asn Asn Arg Thr Val  
50 55 60

Gln Val Ala Lys Ser Ala Asp Phe Lys Thr Trp Thr Leu Leu Asp Lys  
65 70 75 80

Glu Ala Leu Pro Thr Leu Ala Gly Trp Glu Thr Gln Ile Asp His Trp  
85 90 95

Ala Pro Asp Val Val Arg Arg Val His Ser Pro Ser His Pro Ile Pro  
100 105 110

Phe Pro Gln Ile Gln Thr Asn His His His His Pro Gln Asn Asp Gly  
115 120 125

Lys Tyr Val Leu Tyr Tyr Ser Gly Glu Ala Gln Gln Met Leu Arg His  
130 135 140

His Cys Ile Gly Thr Ala Val Ser Glu Ser Thr Asp Pro Ser Gly Pro  
145 150 155 160

Tyr Ile Pro Asn Pro Thr Pro Leu Ser Cys Arg Leu Asp Gln Gly Gly  
165 170 175

Ser Ile Asp Ala Ser Gly Phe Leu Asp Lys Asp Gly Ser Arg Tyr Val  
180 185 190

## pectinases.ST251

Val Phe Lys Val Asp Gly Asn Ser Ile Gly Asn Gly Gly Asp Cys Asn  
195 200 205

Asn Gly Ile Ala Pro Leu Lys Pro Thr Pro Ile Leu Leu Gln Lys Arg  
210 215 220

Arg Ala Val Gly Gly Pro Glu Phe Asp Ser Ala Trp Gly His Val  
225 230 235 240

Leu Phe Val Leu Leu Asp Ala Leu Leu Tyr Gly  
245 250

<210> 92

<211> 646

<212> PRT

<213> Aspergillus niger

<400> 92

Met Ile Ala Val Ala Lys Trp Leu Tyr Val Ala Val Thr Ala Tyr Phe  
1 5 10 15

His Lys Leu Arg Pro Val Ser His Asp Tyr Pro Ala Leu Ala Ala Arg  
20 25 30

Asp Asn Gly Thr Asn Gly Ser Val Ala Ser Pro Ile Thr Leu Thr Val  
35 40 45

Glu Glu Ser Gly Gly Asn Gln Ser Ser Pro Leu Leu Tyr Gly Val Met  
50 55 60

Phe Glu Val Ile Tyr Ser Gly Asp Gly Gly Ile His Gly Gln Leu Leu  
65 70 75 80

Gln Asn Asn Gly Phe Gln Gly Asp Asp Pro Gly Leu Thr Ala Tyr Lys  
85 90 95

Ala Val Gly Pro Val Asp Leu Met Gln Asp Leu Ile Asn Pro Val Ser  
100 105 110

## pectinases.ST251

Gly Ala Ile Thr Ser Ser Leu Gln Val Ser Val Asp Phe Glu Ala Thr  
115 120 125

Gly Phe Val Gly Phe Ala Asn Thr Gly Tyr Ser Gly Ile Pro Val Met  
130 135 140

Asn Ala Thr Tyr Ser Cys Gln Phe Trp Met Met Gly Glu Tyr Ser Gly  
145 150 155 160

Thr Ile Met Leu Gln Leu Ala Gly Ser Thr Asn Asp Thr Ile Tyr Ala  
165 170 175

Ser His Asn Ile Thr Val Lys Ser Ser Trp Gly Lys Phe Thr His Tyr  
180 185 190

Gln Thr Ser Phe Asn Ser Ser Ala Ala Pro Asp Gly Asp Asn Glu Trp  
195 200 205

Arg Leu Leu Phe Asn Gly Ser Lys Met Ala Gly Gly Met Leu Asn Phe  
210 215 220

Gly Leu Val Gln Leu Phe Pro Pro Thr Tyr Lys Ser Arg Ser Asn Gly  
225 230 235 240

Leu Arg Asn Asp Val Ala Thr Phe Leu Glu Lys Thr Ala Pro Ser Phe  
245 250 255

Leu Arg Phe Pro Gly Gly Asn Asn Leu Glu Gly Leu Gln Ile Asp Ser  
260 265 270

Arg Trp Gln Trp Asn Leu Thr Val Gly Pro Val Val Asp Arg Pro Gly  
275 280 285

Arg Gln Gly Asp Trp Phe Tyr Pro Asn Thr Asp Ala Leu Gly Leu Asp  
290 295 300

Glu Tyr Leu Trp Trp Cys Glu Asp Met Asn Met Glu Pro Val Leu Ala  
305 310 315 320

## pectinases.ST251

Val Trp Asp Gly Lys Ser Tyr Gly Gly Ile Leu Ser Gly Asp Asp Leu  
325 330 335

Gln Pro Tyr Ile Asp Asp Ile Met Asn Glu Leu Glu Tyr Leu Leu Gly  
340 345 350

Pro Val Asn Ser Thr Tyr Gly Ser Met Arg Ala Gln Asn Gly Arg Ser  
355 360 365

Lys Pro Trp Ser Ile Asn Tyr Ile Glu Ile Gly Asn Glu Asp Asp Phe  
370 375 380

Thr Gly Gly Cys Asp Thr Tyr Pro Asp Arg Phe Tyr Gln Ile Tyr Asn  
385 390 395 400

Ala Ile Ser Asn Ser Tyr Pro Asn Ile Thr Leu Ile Ala Ser Asn Ile  
405 410 415

Asp Tyr Leu Cys Leu Pro Ile Glu Pro Pro Pro Gly Leu Ile Tyr Asp  
420 425 430

Tyr His Tyr Tyr Arg Lys Pro Asp Asp Leu Val Ala Met Phe Asp Tyr  
435 440 445

Trp Asp Asn Gln Pro Arg Thr Gln Pro Ile Met Val Gly Glu Tyr Gly  
450 455 460

Cys Arg Asp Thr Ser Glu Ala Asp Gly Ile Phe Trp Ser Ser Met Gln  
465 470 475 480

Cys Ser Cys Ser Glu Ala Ala His Met Ile Gly Leu Glu Arg Asn Ser  
485 490 495

Asp Val Val Lys Met Ala Ala Tyr Ala Pro Leu Leu Gln His Phe Gly  
500 505 510

Tyr Thr Gln Trp Ser Pro Thr Leu Phe Gly Phe Asp Ser Ser Pro Asp  
515 520 525

## pectinases.ST251

Ser Leu Thr Pro Ser Thr Ser Tyr Tyr Val Gln Arg Met Phe Ser Thr  
530 535 540

Asn Arg Gly Asp Thr Ile Leu Pro Val Asn Thr Thr Ala Thr Phe Gly  
545 550 555 560

Pro Leu Tyr Trp Val Ala Ser Arg Thr Asn Ser Thr Tyr Phe Val Lys  
565 570 575

Leu Ala Asn Tyr Gly Ala Gln Asn Gln Thr Val Arg Val Lys Val Pro  
580 585 590

Gln Thr Lys Thr Gly His Val Glu Met Leu Tyr Gly Pro Gln Asn Ala  
595 600 605

Thr Asn Leu Val His Asn Ile Thr Val Gln Pro Thr Val Lys Asn Val  
610 615 620

Thr Ser Ser Arg Gly Ile Tyr Ser Leu Asp Met Pro Pro Trp Gly Val  
625 630 635 640

Ala Val Leu Ser Val Trp  
645

<210> 93  
<211> 396  
<212> PRT  
<213> Aspergillus niger

<400> 93

Met Pro Ala Thr Glu Ala Ala Ser Thr Val His Ser Pro Pro Val Ser  
1 5 10 15

His Ser Ile Pro Pro Pro Met Asn Leu Val Leu His Gly Phe Ser Ser  
20 25 30

Val Pro Gly Leu Val Ala Gly Asn Gly His Asp Cys His Phe Pro Ile  
35 40 45

His Ala Thr Pro Ala Cys Pro Leu Ala Asp Tyr Arg Cys Leu His Gly

50 55 60 pectinases.ST251

Arg Pro Ser Tyr Thr Cys Ser Cys Leu Asn Phe Cys Gln Thr Glu Leu  
65 70 75 80

Ser Thr Gln Leu Phe Arg His Ile Arg Ser Ser Ser Ala Gly Gly Ala  
85 90 95

Ala Asp Ser Ile Pro Cys Arg Ala His Leu Ser Arg Gly Gly His Phe  
100 105 110

Phe Ser Phe Glu Leu Glu Asp Glu Gly Tyr Ser Tyr Lys Asn Leu Lys  
115 120 125

Gly Gln Ser Gln Ala Leu Glu Thr Ile Leu Ala Glu Ala Gly Ile Asn  
130 135 140

Ser Val Arg Gln Arg Val Trp Gly Gln Phe Gln Ser Trp His Leu Gln  
145 150 155 160

Phe Gly Leu Gln Leu Gly Ala Gly Lys Arg Val Lys Ala Ala Gly Met  
165 170 175

Ser Ile Tyr Leu Asp Leu His Leu Asn Asn Asn Ile Asp Ile Glu Ile  
180 185 190

Ile Ser Ile Gly Asn Glu Ile Arg Ala Gly Leu Leu Trp Pro Leu Gly  
195 200 205

Glu Thr Ser Ser Tyr Ser Asn Ile Gly Ala Leu Leu Tyr Ser Gly Ala  
210 215 220

Trp Gly Val Lys Asp Ser Asn Leu Ala Thr Leu Pro Lys Ile Ile Ile  
225 230 235 240

His Leu Asp Asp Gly Trp Ser Trp Asp Gln Gln Ser Tyr Phe Tyr Lys  
245 250 255

Thr Val Leu Ser Thr Gly Glu Leu Leu Asn Thr Asp Phe Asp Tyr Phe

## pectinases.ST251

260

265

270

Gly Val Leu Tyr Tyr Leu Phe Tyr Ser Ala Ser Val Asn Ile Ala Ser  
275 280 285

Leu Lys Thr Ser Leu Ala Asn Leu Gln Ser Ile Tyr Asn Lys Pro Val  
290 295 300

Val Val Val Glu Met Asn Trp Pro Val Pro Cys Pro Asn Pro Glu Tyr  
305 310 315 320

Ser Cys Phe Ser Asp Pro Arg Leu Ile Ser Phe Ser Val Ala Gly Gln  
325 330 335

Gln Gln Phe Leu Glu Lys Leu Ala Ala Val Val Glu Ala Thr Thr Asp  
340 345 350

Gly Gln Gly Val Tyr Tyr Trp Glu Pro Ala Trp Ile Thr Asn Ala Gly  
355 360 365

Val Gly Ser Ser Cys Asp Glu Asn Leu Met Val Asp Arg Ser Thr Asp  
370 375 380

Glu Val Tyr Ala Ser Phe Asp Ile Leu Gly Lys Leu  
385 390 395

<210> 94  
<211> 379  
<212> PRT  
<213> Aspergillus niger

<400> 94

Met Lys Tyr Ser Thr Ile Phe Ser Ala Ala Ala Ala Val Phe Ala Gly  
1 5 10 15

Ser Ala Ala Ala Val Gly Val Ser Gly Ser Ala Glu Gly Phe Ala Glu  
20 25 30

Gly Val Thr Gly Gly Asp Ala Thr Pro Val Tyr Pro Asp Thr Ile  
35 40 45

## pectinases.ST251

Asp Glu Leu Val Ser Tyr Leu Gly Asp Asp Glu Ala Arg Val Ile Val  
50 55 60

Leu Thr Lys Thr Phe Asp Phe Thr Asp Ser Glu Gly Thr Thr Thr Gly  
65 70 75 80

Thr Gly Cys Ala Pro Trp Gly Thr Ala Ser Ala Cys Gln Val Ala Ile  
85 90 95

Asp Gln Asp Asp Trp Cys Glu Asn Tyr Glu Pro Asp Ala Pro Ser Ile  
100 105 110

Ser Val Glu Tyr Tyr Asn Ala Gly Val Leu Gly Ile Thr Val Thr Ser  
115 120 125

Asn Lys Ser Leu Ile Gly Glu Gly Ser Ser Gly Ala Ile Lys Gly Lys  
130 135 140

Gly Leu Arg Ile Val Ser Gly Ala Glu Asn Ile Ile Ile Gln Asn Ile  
145 150 155 160

Ala Val Thr Asp Ile Asn Pro Lys Tyr Val Trp Gly Gly Asp Ala Ile  
165 170 175

Thr Leu Asp Asp Cys Asp Leu Val Trp Ile Asp His Val Thr Thr Ala  
180 185 190

Arg Ile Gly Arg Gln His Tyr Val Leu Gly Thr Ser Ala Asp Asn Arg  
195 200 205

Val Ser Leu Thr Asn Asn Tyr Ile Asp Gly Val Ser Asp Tyr Ser Ala  
210 215 220

Thr Cys Asp Gly Tyr His Tyr Trp Gly Ile Tyr Leu Asp Gly Asp Ala  
225 230 235 240

Asp Leu Val Thr Met Lys Gly Asn Tyr Ile Tyr His Thr Ser Gly Arg  
245 250 255

## pectinases.ST251

Ser Pro Lys Val Gln Asp Asn Thr Leu Leu His Cys Val Asn Asn Tyr  
260 265 270

Phe Tyr Asp Ile Ser Gly His Ala Phe Glu Ile Gly Glu Gly Gly Tyr  
275 280 285

Val Leu Ala Glu Gly Asn Val Phe Gln Asn Val Asp Thr Val Leu Glu  
290 295 300

Thr Tyr Glu Gly Ala Ala Phe Thr Val Pro Ser Thr Thr Ala Gly Glu  
305 310 315 320

Val Cys Ser Thr Tyr Leu Gly Arg Asp Cys Val Ile Asn Gly Phe Gly  
325 330 335

Ser Ser Gly Thr Phe Ser Glu Asp Ser Thr Ser Phe Leu Ser Asp Phe  
340 345 350

Glu Gly Lys Asn Ile Ala Ser Ala Ser Ala Tyr Thr Ser Val Ala Ser  
355 360 365

Ser Val Val Ala Asn Ala Gly Gln Gly Asn Leu  
370 375

<210> 95  
<211> 379  
<212> PRT  
<213> Aspergillus niger

<400> 95

Met His Tyr Lys Leu Leu Phe Ala Ala Ala Ala Ser Leu Ala Ser  
1 5 10 15

Ala Val Ser Ala Ala Gly Val Val Gly Ala Ala Glu Gly Phe Ala His  
20 25 30

Gly Val Thr Gly Gly Ser Ala Ser Pro Val Tyr Pro Thr Thr Thr  
35 40 45

## pectinases.ST251

Asp Glu Leu Val Ser Tyr Leu Gly Asp Asn Glu Pro Arg Val Ile Ile  
50 55 60

Leu Asp Arg Thr Phe Asp Phe Thr Gly Thr Glu Gly Thr Glu Thr Thr  
65 70 75 80

Thr Gly Cys Ala Pro Trp Gly Thr Ala Ser Gln Cys Gln Val Ala Ile  
85 90 95

Asn Leu His Ser Trp Cys Asp Asn Tyr Gln Ala Ser Ala Pro Lys Val  
100 105 110

Ser Val Thr Tyr Asp Lys Ala Gly Ile Leu Pro Ile Thr Val Asn Ser  
115 120 125

Asn Lys Ser Ile Val Gly Gln Gly Thr Lys Gly Val Ile Lys Gly Lys  
130 135 140

Gly Leu Arg Val Val Ser Gly Ala Lys Asn Val Ile Ile Gln Asn Ile  
145 150 155 160

Ala Val Thr Asp Ile Asn Pro Lys Tyr Val Trp Gly Gly Asp Ala Ile  
165 170 175

Thr Val Asp Asp Ser Asp Leu Val Trp Ile Asp His Val Thr Thr Ala  
180 185 190

Arg Ile Gly Arg Gln His Ile Val Leu Gly Thr Ser Ala Asp Asn Arg  
195 200 205

Val Thr Ile Ser Tyr Ser Leu Ile Asp Gly Arg Ser Asp Tyr Ser Ala  
210 215 220

Thr Cys Asn Gly His His Tyr Trp Gly Val Tyr Leu Asp Gly Ser Asn  
225 230 235 240

Asp Met Val Thr Leu Lys Gly Asn Tyr Phe Tyr Asn Leu Ser Gly Arg  
245 250 255

## pectinases.ST251

Met Pro Lys Val Gln Gly Asn Thr Leu Leu His Ala Val Asn Asn Leu  
260 265 270

Phe His Asn Phe Asp Gly His Ala Phe Glu Ile Gly Thr Gly Gly Tyr  
275 280 285

Val Leu Ala Glu Gly Asn Val Phe Gln Asp Val Asn Thr Val Val Glu  
290 295 300

Thr Pro Ile Ser Gly Gln Leu Phe Ser Ser Pro Asp Ala Asn Thr Asn  
305 310 315 320

Gln Gln Cys Ala Ser Val Phe Gly Arg Ser Cys Gln Leu Asn Ala Phe  
325 330 335

Gly Asn Ser Gly Ser Met Ser Gly Ser Asp Thr Ser Ile Ile Ser Lys  
340 345 350

Phe Ala Gly Lys Thr Ile Ala Ala Ala His Pro Pro Gly Asn Ile Ala  
355 360 365

Gln Trp Thr Met Lys Asn Ala Gly Gln Gly Lys  
370 375

<210> 96  
<211> 395  
<212> PRT  
<213> Aspergillus niger

<400> 96

Met Lys Val Pro Phe Leu Gln Leu Leu Cys Leu Asn Ala Ala Leu Ala  
1 5 10 15

Ser Ala Asn Val Val Lys Gly Ala Ala Gln Gly Phe Ala Ala Gly Val  
20 25 30

Thr Gly Gly Asp Ile Thr Pro Ser Tyr Pro Lys Thr Asn Glu Glu  
35 40 45

## pectinases.ST251

Leu Val Ser Leu Leu Glu Ser Asp Glu Pro Gln Val Val Val Leu Thr  
50 55 60

Lys Thr Phe Glu Phe Ile Gly Thr Glu Gly Thr Thr Thr Glu Asn Gly  
65 70 75 80

Cys Ala Pro Trp Gly Thr Gly Lys Ser Cys Gln Leu Ala Ile Asn Ser  
85 90 95

Asn Gly Trp Cys Gly Lys Asn Pro Val Val Thr Ile Thr Tyr Asp Asn  
100 105 110

Ala Ala Lys Asn Gly Ile His Ile Lys Ser Asn Lys Thr Leu Val Gly  
115 120 125

Glu Gly Asp Lys Gly Val Leu Ser Gly Lys Gly Leu Tyr Phe Glu Gly  
130 135 140

Gly Val Ser Asn Ile Ile Val Gln Asn Ile Lys Ile Thr Asn Leu Asn  
145 150 155 160

Pro Gly Phe Val Trp Gly Gly Asp Ala Phe Thr Phe Phe Gly Ala Asp  
165 170 175

Leu Ile Trp Ile Asp His Cys Glu Thr Ser Leu Thr Gly Arg Gln His  
180 185 190

Tyr Val Thr Gly Phe His Pro Asn Thr Arg Met Thr Trp Ser Asn Asn  
195 200 205

Phe Leu Asn Gly Val Thr Thr His Ser Ala Gly Cys Asp Asp His His  
210 215 220

Tyr Trp Thr Met Glu Leu Val Gly Pro Gly Asp Gln Ile Thr Phe Gln  
225 230 235 240

Asn Asn Tyr Val Tyr His Thr Thr Gly Arg Gly Pro Ala Leu Ser Gly  
245 250 255

## pectinases.ST251

Thr Thr Leu Phe His Ala Val Asn Ser Val Trp Ser Ser Ile Pro Gly  
260 265 270

His Ala Ile Glu Gly Gly Asp Lys Gly Arg Gly Leu Phe Glu Gly Cys  
275 280 285

Phe Phe Glu Asp Val Val Glu Ile Ala Pro Ala Lys Pro Glu Asn Gln  
290 295 300

Leu Phe Ser Ala Ser Glu Ala Asn Ala Ala Ser Cys Lys Ser Ala Leu  
305 310 315 320

Gly Arg Ala Cys Gln Ala Asn Ser Tyr Ser Lys Ser Gly Ala Phe Gly  
325 330 335

Ser Ser Glu Thr Gly Phe Phe Lys Asp Phe Ala Gly Leu Thr Ile Ala  
340 345 350

Pro Ala Gly Ser Ala Thr Asp Ala Leu Ala Tyr Val Pro Lys Asn Cys  
355 360 365

Val Cys Ile Lys Gln Glu Gly Gly Phe Ser Lys Ala Arg Asn Phe Leu  
370 375 380

His Val Lys Gln Pro Asn Trp Leu Asp Pro Thr  
385 390 395